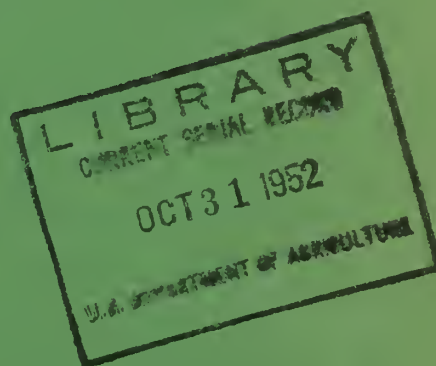


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ABSTRACTS *of* RECENT PUBLISHED MATERIAL on Soil and Water Conservation



UNITED STATES DEPARTMENT OF AGRICULTURE
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ABSTRACTS OF RECENT PUBLISHED MATERIAL ON SOIL AND WATER CONSERVATION

Prepared by J. H. Stallings, Research Specialist,
Soil Conservation Service

This is the SEVENTH of the publications issued under this title. These publications are issued at irregular intervals, depending on the amount of material published.

Their purpose is to bring together a summary of current information about soil and water conservation for ready reference of those actively engaged in soil conservation work. Distribution is confined to technical personnel of the Soil Conservation Service and cooperating agencies and to such other scientists or conservation workers as specifically request it.

The active cooperation of Soil Conservation Service personnel and others who write conservation material is needed if these publications are to serve their intended purpose adequately. Such cooperation can best be rendered by supplying an abstract, reprint, or copy of the material as soon as it is published to J. H. Stallings, Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C.

SUBJECT-MATTER INDEX

Page

AERIAL PHOTOGRAPHS		bitterbrush on the Upper Snake River plains.	16
Air photo interpretation inventory and planning.	62	Hints of eradication of big sagebrush (<i>Artemisia tridentata</i>) by chemical spraying and by burning.	16
AGGREGATES		Progress report, 1951: Brush control research at the Red Plains Conservation Experiment Station, Guthrie, Oklahoma.	26
Big Flats -- A story of soil structure.	41	Reseeding sagebrush lands of western Colorado.	20
Effect of fumigation on soil aggregation.	71	Vegetation of the creosotebush area of the Rio Grande Valley in New Mexico.	24
Microscopic changes in soil structure during compression.	6	BURNING	
Properties of soil which influence wind erosion: IV - State of dry aggregate structure.	38	Effects of controlled burning on bitterbrush on the Upper Snake River plains.	16
Report of the national soil structure - organic matter work group to the national soil and fertilizer research committee.	21	Hints of eradication of big sagebrush (<i>Artemisia tridentata</i>) by chemical spraying and by burning.	16
Soil aggregate formation.	7		
Structure and its influence on tilth of soils.	6	CATIONS	
Studies on soil structure.	25	Cation-exchange capacity of plant roots.	18
The effects of plant residue cover and clod structure on soil losses by wind.	3	Cation exchange in soils: I - Ammonium fixation and its relation to potassium fixation and to determination of ammonium exchange capacity.	38
Theory of probability and size distribution of soil aggregates.	13	Effect of particle size of limestones on soil reaction, exchangeable cations, and plant growth.	47
ACRONOMY		Estimation of exchangeable cations in soils with the Beckman flame spectrophotometer.	13
Handbook of Ohio experiments in agronomy.	46	CHANNELS	
ALFALFA		Hydraulic model studies for Whiting Field Naval Air Station, Milton, Florida Part V - Studies of open-channel junctions.	22
Boron content of alfalfa as influenced by boron supply.	5	Numerical analysis of continuous unsteady flow in open channels.	64
Greenhouse studies of plant composition as affected by fertilizer treatments and stage of growth of alfalfa on a Cecil sandy loam.	52	Preliminary report of tests on a grass-lined channel with a center concrete gutter section.	21
The effect of harvesting practices on yield and winter survival of alfalfa under irrigation.	4	Study of seepage losses from irrigation channels.	62
The use of the trench-wash and soil-elution methods for studying alfalfa roots.	37	CHEMICALS	
Wisconsin bankers finance sure-fire alfalfa program.	56	A new concept - Using chemicals for soil structure improvement.	61
AMMONIUM FIXATION		Both cultural and chemical practices needed to prevent crabgrass in lawns.	52
Ammonium fixation and availability in Horpster clay loam.	12	Carotene, protein, and phosphorus in range and tame grasses of western North Dakota.	20
BASE EXCHANGE		Chemical control of established Johnson grass on noncultivated land.	23
Origin of the base-exchange capacity of clays and significance of its upper limiting value.	63	Chemical control of inferior species in the management of loblolly pine.	17
BASIC SLAG		Chemical control of crabgrass in special purpose turf.	56
Blast furnace slags as agricultural liming materials.	8	Chemicals take over cotton weeding.	63
BED LOAD			
Turbulence flume to measure bed load.	49		
BIBLIOGRAPHY			
Books, booklets, bulletins on soil and water conservation.	30		
List of references to boron literature.	31		
BRUSH CONTROL			
Effects of controlled burning on			

	Page		Page
Disappearance of 2,4-Dichlorophenoxy- acetic acid and 2,4,5-Trichloro- phenoxyacetic acid from soil.	2	determination of two cationic activities.	34
Effect of fumigation on some chemical properties of soils.	44	Irrigation of soils and soil col- loids: II. Potassium-calcium re- lationships in montmorillonite group clays and in attapulgite.	38
Ladino clover - its mineral require- ments and chemical composition.	40	Ionization of soils and soil col- loids: III. Potassium-calcium re- lationships in illite, kaolinite, and hallogsite.	64
Mesquite seed and seedling response to 2,4-D and 2,4,5-T.	57	CONSERVATION	
Quality and quantity of seed from bitterweed killed with herbicides.	56	A community approach to soil conser- vation.	21
Rada for algae.	27	Just what is conservation?	39
Response of Wyethia to 2,4-D.	58	Soil management, soil sense, and con- servaion.	31
Short cuts to weed killing calcula- tions: Part 6 - Preparing weed- killing solutions with liquid.	27	Soil conservation in southwestern Wisconsin.	11
Short cuts to weed killing calcula- tions: Part 7 - How to prepare weed killers for woody plants.	29	Some agricultural engineering pro- blems in soil and water conser- vation.	11
Short cuts to weed killing calcula- tions: Part 8 - How to apply aro- matic solvents to control water- weeds.	30	Teamwork on the land.	44
Short cuts to weed killing calcula- tions: Part 9 - Calibrating the rig for aromatic solvents appli- cations.	31	The job ahead.	45
Stability of DDT and its effect on microbial activities of soil.	51	CONSUMPTIVE USE	
The decomposition of a pentachlo- ropheno when applied as a residual pre-emergence herbicide.	34	Conservation and consumptive use of water with sugar cane under irriga- tion in the south coastal area of Puerto Rico.	62
The protein, phosphoric acid and lime content of small grains, Harding- grass, alfalfa and sweetclover grown in the lower Rio Grande Valley.	19	Consumptive use of water.	26
The use of chlordan for the control of crabgrass.	31	Consumptive use of water on irriga- ted land.	53
Weed control with methyl bromide.	59	Consumptive use of water by forest and range vegetation.	54
CLAY MINERALS		Use of water by phreatophytes in 2000-foot channel between Granite Reef and Gillespie Dams, Maricopa County, Arizona.	55
Formation of mixed layer minerals by potassium fixation in montmorillon- ite.	4	CORN	
The effect of humus on cationic inter- actions in a beidellite clay.	65	Corn fertility and spacing studies at the Blackland Station, 1948-50.	15
The influence of clay minerals on the enzymatic hydrolysis of organic phosphorus compounds.	1	Corn fertility studies at the Black- land Station, 1949-51.	21
Weathering sequence of clay-size minerals in soils and sediments: II. Chemical weathering of layer silicates.	1	Effects of legumes in different crop- ping systems on yield of corn.	70
CLIMATIC CALENDAR		Lodging, leaf composition, and yield of corn as influenced by heavy appli- cations of nitrogen and potash.	37
Don't plant in the dark of the moon: Use the 'climate calendar' instead.	42	New way to grow corn.	42
CLOUD SEEDING		The importance of nitrogen and water in reducing competition between intercrops and corn.	38
Some evaluations of sustained cloud- seeding operations.	54	This may revolutionize the way you grow corn.	41
COLLOIDS		COTTON	
Electrophoretic and chromatographic investigations of clay-adsorbed organic colloids: I. Preliminary investigations.	6	Chemical weed control in cotton.	57
Irrigation of soils and soil col- loids: I. Method for simultaneous		Control of seedling grass in cotton.	30
		Cotton yields in the El Paso Valley as influenced by applications of ammonium nitrate and superphos- phate.	15
		Effect of tillage depth on soil con- ditions and cotton plant growth for two Alabama soils.	51
		COVER CROPS	
		Cucamonga brome - A new grass for	

	Page		Page
covercropping.	10	improvised baffle.	16
Winter covercrops.	10	Improved rotary sieve for measuring state and stability of dry soil structure.	64
CROPS		Methods and equipment for harvesting Ladino clover seed.	50
A continuous supply of soil moisture to the growing crop gives highest yield.	9	Moisture hysteresis in gypsum moisture blocks.	4
Irrigation requirements of crops.	38	Porous tube device for sampling soil solutions during water-spreading operations.	51
Microorganisms and their effects on crops and soils.	25	The brushland plow.	16
CROP ROTATION		Turbulence flume to measure bed load.	49
Conservation effects of crop rotation on a sandy soil in vegetable production.	36	EROSION	
Effects of forty years of cropping under irrigation.	32	Erosion control in engineering works.	50
		Erosion control at Shasta and Keswick.	29
DIFFUSION		Relation of sedimentation to accelerated erosion in the Missouri River Basin.	22
An electrical analogue for the study of diffusion processes with gains or losses.	48	Soil-fertility losses by erosion.	17
Gaseous diffusion on porosity in porous media.	43	Seeding grass in the row with soybeans reduces soil erosion.	35
DITCHES		EVAPOTRANSPIRATION	
New check for farm ditches.	27	Determining evapotranspiration by phreatophytes from climatological data.	54
DRAIN TILE		EXCHANGEABLE MAGNESIUM	
Depth and spacing for drain laterals as computed from core-sample permeability measurements.	42	Flame photometric determination of exchangeable magnesium in soils.	4
DRAINAGE			
Drainage of irrigated lands in the Lower Rio Grande Valley of Texas.	38	FARM MACHINERY	
Ground water and drainage investigations in San Fernando Valley, Los Angeles, California.	23	A grain plot harvester.	32
Irrigation and drainage investigations Weber Basin Project, Utah.	27	A tractor mounted meter attachment for side band application of fertilizer to tobacco plots.	33
Land preparation for irrigation and drainage.	35	The place of farm machinery in soil conservation.	18
Management of irrigation and drainage enterprises in Utah.	22	FERTILIZERS	
Problems of drainage in a soil and water conservation program.	35	Accumulation of the major bases and heavy metals in Florida citrus soils in relation to phosphate fertilization.	63
Surface drainage of tight soils in the Midwest.	51	A preliminary investigation of orchard grass seed production as influenced by nitrogen applied as a spray.	13
The drainage of irrigated lands.	35	A theory on the soil atmosphere in and around a hemisphere in which soil gases are used or released.	67
ECONOMICS		Comparisons between spray and soil applications of nitrogen on wheat.	51
Conservation problems and achievements on selected midwestern farms.	27	Corn fertility and spacing studies at the Blackland Station, 1948-50.	15
Soil conservation pays - Effects of specific practices on yields and on costs.	10	Cotton yields in the El Paso Valley as influenced by applications of ammonium nitrate and superphosphate.	15
The economics of idle resources.	41	Effects of fertilizers upon the yields, size and quality of orange fruits.	10
ENGINEERING		Effect of sources of nitrogen, rates of application and method of application on seed production of orchard grass.	14
Erosion control in engineering works.	50	Effect of rate and method of applying sources of nitrogen upon the yield	
Regional engineering handbook, part three - conservation irrigation.	29		
Some agricultural engineering problems in soil and water conservation.	11		
EQUIPMENT			
A recalibration of the hydrometer method for making mechanical analysis of soils.	9		
A tin can infiltrometer with			

	Page		Page
and composition of Bermuda grass, <i>Cynodon dactylon</i> (L) pers., hay.	50	unsteady flow in open channels.	64
Effect of organic matter on phosphate availability.	51	Some theoretical aspects of the flow of water in unsaturated soils.	66
Fertilizer helps conserve soil and water in Oklahoma.	24	FOOD PRODUCTION	
Fertilizer use and crop yields in the north central region.	24	America's capacity to produce food.	40
Fertilizer use and crop yields in the United States.	26	FORAGE	
Fertilizer recommendations based on soil tests.	28	Absorption of mineral elements by forage plants: III. The relation of growth to micro-nutrient element content of timothy and some legumes.	37
Fertilizer practices in the balanced farming program in Missouri.	56	California grasslands and range forage grasses.	10
Forms and distribution of phosphorus in the horizons of some Nebraska soils in relation to profile development.	18	Measuring consumption and digestibility of winter range plants by sheep.	33
Greenhouse studies of plant composition as affected by fertilizer treatments and state of growth of alfalfa on a Cecil sandy loam.	52	The Dalles pocket gopher and its influence on forage production of Oregon mountain meadows.	20
Lodging, leaf composition, and yield of corn as influenced by heavy applications of nitrogen and potash.	37	The protein, phosphoric acid, and lime content of small grains, Hardinggrass, alfalfa, and sweetclover grown in the Lower Rio Grande Valley.	19
Pasture improvement with 10-10-10 fertilizer.	28	FREEZING POINT	
Potassium removal from Iowa soils by greenhouse and laboratory procedures.	18	Effect of salinity on moisture content and freezing-point depressing of soil at permanent wilting of plants.	12
Recovery of fertilizer nitrogen by oats in the greenhouse.	51	Freezing point of water in a soil as related to salt and moisture contents of the soil.	12
Release of potassium from non-exchangeable forms from size fractions of several Iowa soils.	3	FRUITS	
Residual effects of phosphorus in soil at different pH levels as measured by yield and phosphorus uptake by oats.	12	Effects of fertilizers upon the yields, size, and quality of orange fruits.	10
Solubility of iron, aluminum, calcium, and magnesium insitol phosphates at different pH values.	12	GEOLOGICAL SURVEY	
The magic of nitrogen.	49	Mississippi State geological survey.	21
The intensive production of herbage for crop-drying. III. The effect of the continued application of nitrogenous fertilizers to grassland.	14	GRASSES	
The intensive productions of herbage for crop-drying: IV. The effect of massive applications of nitrogen with and without phosphate and potash on the yield of grassland herbage.	14	A preliminary investigation of orchard grass seed production as influenced by nitrogen applied as a spray.	13
Topdressing legume meadows in Iowa.	9	Buffelgrass.	14
Uptake and movement of fertilizer phosphorus.	60	Converting standard seeding rates for grasses to actual seeding rates per acre.	16
Yield and quality of peas for processing as affected by lime and fertilizers.	69	Carotene, protein, and phosphorus in range and tame grasses of western North Dakota.	20
FLOOD CONTROL		Crested wheatgrass grazing values.	57
Making a creek flow gently.	11	Cucamonga brome - A new grass for covercropping.	10
Use of snow surveys in planning regulation of Columbia River floods.	26	Effect of sources of nitrogen, rates of application, and method of application on seed production of orchard grass.	14
FLOW		Effect of crimson clover on the yield and chemical composition of cool season grasses.	30
Numerical analysis of continuous		Growth characteristics of blue grama in northeastern Colorado.	40
		Mineral composition of orchard grass grown on Pachappa loam salinized with various salts.	34
		Seasonal periods for planting grasses	

	Page		Page
in the subalpine zone of central Utah.	15	three - conservation irrigation.	29
Warm season grasses in the Lower Rio Grande Valley.	14	HEALTH	
GRASSLAND		The effect of fertilizers on the nutritive quality of crops and the health of animals and men.	23
California grasslands and range forage grasses.	10	HYDROGRAPHS	
Grassland farming.	18	Evaluation of two elements affecting the characteristics of the recession curve.	8
Grassland farming.	23	Parameters for relating unit hydrographs to watershed characteristics.	8
Grassland management - range.	16	HYDRAULICS	
M. V. Corey, Middletown, R. I., 1951 N. E. grassland winner.	28	Agricultural hydrology as evaluated by monolith lysimeters.	55
Native grassland judging.	26	Capacity of box inlet drop spillways under free and submerged flow conditions.	22
Terraces on grassland: A study of terraced and unterraced areas on eroded, shallow soil, before and after revegetation with native grasses.	10	Evaluation of the critical regime in stratified flow.	48
The intensive production of herbage for crop-drying. III. The effect of the continued application of nitrogenous fertilizers to grassland.	14	Hydraulic gradients during infiltration in soils.	3
The intensive productions of herbage for crop-drying. IV. The effect of massive applications of nitrogen with and without phosphate and potash on the yield of grassland herbage.	14	Hydraulic model studies for Whiting, Field Naval Air Station, Milton, Florida: Part V - Studies of open-channel junctions.	22
Trends toward grassland agriculture in the Southeast.	23	Results of tests on a chute with a St. Anthony Falls stilling basin.	25
GRAZING		Selected list of publications on hydrology and hydraulics.	19
Changes in ponderosa pine bunchgrass ranges in northern Arizona resulting from pine regeneration and grazing.	15	Unit-hydrograph lag and peak flow related to basin characteristics.	64
Crested wheatgrass grazing values.	57	INCOME	
Effect of farm woodland grazing on watershed values in the southern Appalachian Mountains.	45	Conservation farming on experimental watershed increases farm income.	36
Range practices that cause animals to graze all parts of the range equally.	22	INSECTICIDES	
Some effects of livestock grazing on ponderosa pine forest and range in central Washington.	57	Persistence of chlorinated hydrocarbon insecticides in turf treated to control the Japanese beetle.	29
Woodland forage in the Arkansas Ozarks.	35	Residual values of certain insecticides against adults and larvae of <i>phyllophaga</i> spp.	58
GROUND WATER		Rotenone at Bumping Lake.	29
Ground water investigations along Bogue Phalia between Symonds and Malvina, Bolivar County.	9	Some plant responses to certain insecticides in the soil.	18
Ground water and drainage investigations in San Fernando Valley, Los Angeles, California.	23	INFILTRATION	
The effect of ground water-level upon productivity and composition of fenland grass.	32	Factors affecting rate of water intake in Texas Blacklands.	36
The problem of safe yield in insular Ghyben-Herzberg system.	33	Hydraulic gradients during infiltration in soils.	3
HANDBOOK		Recording the intake of water into the soil.	62
Handbook of Ohio experiments in agronomy.	46	ION ACTIVITIES	
Regional engineering handbook, part		Ion activities in sodium-clay suspensions.	65
		Ionic activities in ion-exchange systems.	34
		IRRIGATION	
		A graphic method of solving sprinkler irrigation application problems.	35
		A study of the effects of different amounts of water on surface and subsurface irrigation of lettuce.	12
		Consumptive use of water on irrigated	

	Page		Page
land.	53	monolith lysimeters.	42
Cooperative surface and sprinkler irrigation investigations, Black Canyon project - Progress report for 1951.		LEGUMES	
Cost of water for irrigation on the High Plains.	44	Effect of crimson clover on the yield and chemical composition of cool season grasses.	30
Drainage of irrigated lands in the Lower Rio Grande Valley of Texas.	49	Effects of legumes in different cropping systems on yield of corn.	70
Effects of forty years of cropping under irrigation.	38	Harvesting clover and Dallisgrass seed in the Texas rice belt.	23
Irrigation and drainage investigations Weber Basin project, Utah.	32	Ladino clover - Its mineral requirements and chemical composition.	40
Irrigation experiments on 1951 wheat-alfalfa.	27	Ladino clover seed production in California.	17
Irrigation of soils and soil colloids: I. Methods for simultaneous determination of two cationic activities.	60	Methods and equipment for harvesting Ladino clover seed.	50
Irrigation of soils and soil colloids: II. Potassium-calcium relationships in montmorillonite group clays and in attapulgite.	34	Performance of strains of <i>Lotus corniculatus</i> on the north Pacific coast.	9
Irrigation requirements of crops.	38	Sericea in conservation farming.	20
Irrigation wells and well drilling.	10	Topdressing legume meadows in Iowa.	9
Laboratory evaluation of desert soils for irrigation.	54	LIME	
Land preparation for irrigation and drainage.	35	Blast furnace slags as agricultural liming materials.	8
Management of irrigation and drainage enterprises in Utah.	22	Influence of liming materials on pH values of six Maryland soils.	47
Mechanical siphon primer.	29	Influence of placement of lime compounds on root development and soil characteristics.	48
Phreatophyte control on irrigation projects in New Mexico.	55	Lime requirement determination of soils.	4
Porous tube device for sampling soil solutions during water-spreading operations.	51	Movement and effect of lime and gypsum in soil.	47
Settlers' progress on two North Dakota irrigation projects.	21	One hundred questions and answers on liming land.	8
Soil permeability as a factor in the translocation of salts on irrigated land.	13	The effect of calcium on the growth of soybeans supplied with ammonium nitrogen.	69
Supplemental irrigation in Michigan.	44	Yield and quality of peas for processing as affected by lime and fertilizers.	69
The chemical composition of irrigation water used in Florida citrus groves.	9	LIMESTONE	
The effect of harvesting practices on yield and winter survival of alfalfa under irrigation.	35	A method of estimating the reacting rate of different particle sizes of limestone.	47
KRILLIUM		Effect of particle size of limestones on soil reaction, exchangeable cations, and plant growth.	47
Humus from plastic promises bigger crops, greener lawns.	46	Influence of form, fineness, and amount of limestone on plant development and certain soil characteristics.	48
KUDZU		LITTER	
The effects of fertilizer applications on the yields and nodulation of tropical kudzu.	67	Studies on the holocellulose fraction of hardwood leaves.	50
LAND USE		Weight and nitrogen and calcium content of the annual litter fall of forests in the South Carolina Piedmont.	3
Land use planning.	29	LIVESTOCK	
LEACHING		Brush, grass, beef and dollars.	50
Leaching of calcium in a fine sandy loam as indicated by Ca ⁴⁵ .	63	Feeding salt to livestock.	29
Loss of nitrogen and water from Fayette silt loam as measured by		Measuring consumption and digestibility of winter range plants by sheep.	33

	Page		Page
MANURE		(halogeton glomeratus).	35
Long-time effect of applying barnyard manure at varied rates on crop yield and some chemical constituents of the soil.	38	Research will attempt to give definite answers to questions on halogeton poisoning.	29
MICROORGANISMS		St. Johnswort on western ranges.	58
A determinative study of amylolytic, stenothermophilic bacteria isolated from soil.	50	The Halogeton problem in Utah.	57
Microbial turnover of phosphorus in soil.	5	Timber milk vetch poisoning on British Columbia ranges.	40
Microorganisms and their effect on crops and soils.	25	NUTRIENTS	
Radioactive phosphorus and the growth and metabolic activities of soil microorganisms.	1	A concept concerning the measurement of available soil nutrients.	59
Stability of DDT and its effect on microbial activities of soil.	51	ORGANIC MATTER	
MINOR ELEMENTS		A review of recent work on soil organic matter. Part I.	28
Absorption of mineral elements by forage plants: III. The relation of stage of growth to micronutrient element content of timothy and some legumes.	37	Comparison of organic matter fractions from three soil types.	58
Availability of molybdenum as influenced by liming.	34	Concerning "bio-dynamic farming" and "organic gardening".	28
Boron content of alfalfa as influenced by boron supply.	5	Effect of organic matter on phosphate availability.	51
Effect of iron and aluminum oxides on the release of calcium and on the cation-anion exchange properties of soils.	63	Further studies on the effect of long-time organic matter additions on the physical properties of Sassafras silt loam.	67
Evaluation of certain factors involved in increasing manganese availability with sulfur.	68	The decomposition of partridge pea and its influence on nitrification.	71
Molybdenum content of typical soils and plants of the Hawaiian Islands.	8	The nitrogen distribution and amino acid content of certain soil organic matter fractions.	58
Response of crop plants to I and Br. Simple tests for magnesium and calcium in plant material and magnesium in soils.	43	The organic farming myth.	32
Solubility of iron, aluminum, calcium and magnesium insoluble phosphates at different pH values.	12	ORGANIC PHOSPHORUS	
The effect of sulfur oxidation on the availability of manganese.	66	The influence of clay minerals on the enzymatic hydrolysis of organic phosphorus compounds.	1
The relation of manganese to the carotene and vitamin contents of growing crop plants.	34	PASTURE	
The titanium content of Hawaiian soils and its significance.	2	Brush, grass, beef and dollars.	50
Use of dithizone as an extractant to estimate the zinc nutrient status of soils.	63	Comparisons of the productivity of permanent and rotation pastures on plowable cropland.	33
MULCHES		Grass pastures in central Florida.	30
Effects of organic mulches on soil conditions and soybean yields.	19	How farmers make pasture plans to meet the uncertainty of weather.	59
Mulch tillage: Some effects on plant and soil properties.	70	Improving pastures in Arkansas.	28
Stubble trouble.	55	Pasture improvement.	25
The effects of plant residue cover and clod structure on soil losses by wind.	3	Pasture improvement with 10-10-10 fertilizer.	28
NOXIOUS PLANTS		Soil fertility and pastures.	28
Historical sketch of barilla		The seasonal output of pastures sown with ultrasimple seed mixtures.	32
		Winter pastures are worth \$\$\$\$.	42
		PEANUTS	
		Research points the way to higher levels of peanut production.	40
		PERMEABILITY	
		Depth and spacing for drain laterals as computed from core-sample permeability measurements.	42
		Effect of management on soil permeability.	5
		Some anisotropy and some field methods for measuring permeability.	7

	Page		Page
Soil permeability as a factor in the translocation of salts on irrigated land.	13	Use of Ca ⁴⁵ labeled calcium carbonate in determining proportions of native and additive calcium in lysimeter leachings and in plant uptake.	60
PHYTASE			
Phytase activity in soils.	43		
PLANTS		RANGE	
Some plant responses to certain insecticides in the soil.	18	A method for measuring trend in range condition on national forest ranges.	57
PLANT NUTRIENT		A range land rental system based on grazing capacity and the price of beef.	35
Healthy plants must be well nourished.	16	Brush and weed control investigations on rangeland of the southern Great Plains.	49
Importance of sodium for plant nutrition: V. Response of crops other than beet.	19	Extension of the range front to the south.	36
The effect of fertilizers on the nutritive quality of crops and the health of animals and men.	23	Fourteen-year summary of range improvement studies at the U. S. Southern Great Plains Field Station, Woodward, Oklahoma, 1937-1950.	24
The relative merits of inorganic and organic sources of plant nutrients.	49	Grassland management - Range.	16
PLOW PAN		Indicators of condition and trend on high range-watersheds of the intermountain region.	20
Depth to plow pan as a factor in sugar cane production.	66	Opportunities and needs in range management.	11
POINT ROWS		Putting range management facts to work.	33
Are point rows necessary on terraced land?	35	Range management studies on the ranch experiment station.	56
POTASSIUM FIXATION		Range practices that cause animals to graze all parts of the range equally.	22
Formation of mixed layer minerals by potassium fixation in montmorillonite.	4	Range problems of marginal farm lands.	40
PRECIPITATION		Recommendations for range re-seeding in Utah.	57
Interception of rain and snow by second-growth ponderosa pine.	49	Recommendations for range seeding in Utah.	19
Precipitation in relation to altitude in central Utah.	15	Survival of wheatgrasses on sagebrush range depends on methods of seeding as well as weather conditions.	9
Precipitation in Tennessee River Basin.	26	Tentative guides to range condition, trend, and use from Roosevelt study.	57
PRODUCTION		REPORTS	
Utilizing our soil resources for greater production.	22	Annual report for 1951.	46
Evaluation of air resistance to freely falling drops of water.	39	Annual progress report of experimental work.	45
Fertilizer use and crop yields in the north central region.	24	Annual progress report, Soil Conservation Service Research, Ames, Iowa, 1951.	45
Fertilizer use and crop yield in the United States.	26	Preliminary report of tests on a grass-lined channel with a center concrete gutter section.	21
RADIOACTIVE		Progress report No. 12 of silt load of Texas streams (1949-1940).	11
Experiments with radioactive phosphates in 1949.	31	Progress report, 1951: Brush control research at the Red Plains Conservation Experiment Station, Guthrie, Oklahoma.	26
Influence of soil acidity on absorption of calcium by alfalfa as revealed by radiocalcium.	47	Progress report on the wooded watershed of the Michigan hydrologic	
Plant studies with radioactive calcium.	47		
Radioactive phosphorus and the growth and metabolic activities of soil microorganisms.	1		
RADIOISTOPES			
Leaching of calcium in a fine sandy loam as indicated by Ca ⁴⁵ .	63		
Radiation effects on plants grown in soil treated with fertilizer containing p ³² .	60		
Radioisotopes in soil fertilizer research.	56		

	Page		Page
research station.	60	Feeding salt to livestock.	29
Report of the national soil structure - organic matter work group to the national soil and fertilizer research committee.	21	Freezing point of water in a soil as related to salt and moisture contents of the soil.	12
The nineteenth annual report of the Upper Mississippi Valley Soil Conservation Experiment Station.	25	SEDIMENTATION	
Water report.	27	Relation of sedimentation to accelerated erosion in the Missouri River Basin.	22
RESEARCH		Report on sedimentation in Carnegie Lake, Princeton, New Jersey.	59
A pattern of scientific inquiry for applied research.	52	SEEDS	
A record of research: I.	45	Compatibility of rhizobia with seed protectants.	34
Research points the way to higher levels of peanut production.	40	Harvesting clover and Dallisgrass seed in the Texas rice belt.	23
Research sets patterns for the central blacklands.	22	SEEDING	
Research will attempt to give definite answers to questions on halogeston poisoning.	29	Converting standard seeding rates for grasses to actual seeding rates per acre.	16
RESERVOIRS		Recommendations for range seeding in Utah.	19
Erosion control at Shasta and Keswick.	29	Survival of wheatgrass on sagebrush range depends on methods of seeding as well as weather conditions.	9
Report on sedimentation in Carnegie Lake, Princeton, New Jersey.	59	SEEPAGE	
The silting of Carbondale Reservoir.	27	Study of seepage losses from irrigation channels.	62
The silting of Lake Bracken	27	SHRUB PLANTINGS	
The silting of Lake Calhoun, Galva, Illinois.	64	Shrub plantings for soil conservation and wildlife cover in the Northeast.	24
The silting of West Frankfort Reservoir.	52	SILAGE	
RIVER MEANDERS		Grass silage in Oklahoma.	50
On the origin of river meanders.	48	SILTING	
RODENTS		Progress report No. 12 of silt load of Texas streams (1949-1950).	11
The Dalles pocket gopher and its influence on forage production of Oregon mountain meadows.	20	The silting of Carbondale Reservoir.	27
ROOTS		The silting of Lake Bracken.	27
Cation-exchange capacity of plant roots.	18	The silting of Lake Calhoun, Galva, Illinois.	64
Influence of placement of lime compounds on root development and soil characteristics.	48	The silting of west Frankfort Reservoir.	52
Root channels and roots in forest soils.	5	SMALL GRAIN	
Root mortality of shortleaf and loblolly pine in relation to soils and little leaf disease.	39	Producing small grain more efficiently.	16
The use of the trench-wash and soil-elution methods for studying alfalfa roots.	37	SNOW SURVEYS	
RUNOFF		Special water supply forecast for the Rio Grande Drainage Basin 1952 season.	32
A suggested method for estimating runoff - Part I. Applied to single-unit watersheds.	26	Use of snow surveys in planning regulation of Columbia River floods.	26
Soil layers causing runoff from hard-land wheat fields in Colorado and New Mexico.	36	SOILS	
The measurement of soil and water losses with runoff plots.	45	Accumulation of the major bases and heavy metals in Florida citrus soils in relation to phosphate fertilization.	63
SALT		A method for calculating the solution percentage from the weight of a known volume of saturated soil paste.	13
Effect of salinity on moisture content and freezing-point depression of soil at permanent wilting of plants.	12	A recalibration of the hydrometer method for making mechanical analysis of soils.	9
		A theory on the soil atmosphere in and around a hemisphere in which soil gases are used or released.	67

	Page		Page
Cation exchange in soils: I. Ammonium fixation and its relation to potassium fixation and to determination to ammonium exchange capacity.		loblolly pine in relation to soils and little leaf disease.	39
Characteristics of some brown podzolic profiles in the central lowland of Connecticut and Massachusetts.	38	Rotation fertilization.	17
Characteristics of some podzolic, brown forest, and chernozem soils of the northern portion of the Lake States.	71	Site index of oaks in relation to soil and topography in north-eastern Iowa.	18
Conservation effects of crop rotation on a sandy soil in vegetable production.	65	Some physical facts about Connecticut soils.	61
Disappearance of 2,4-Dichlorophenoxyacetic acid and 2,4,5-Trichloroacetic acid from soil.	2	Soil rehabilitation under eastern red cedar and loblolly pine.	36
Dominant soils of the redwood - Douglas-fir region of California.	68	Some theoretical aspects of the flow of water in unsaturated soils.	66
Effect of fumigation on some chemical properties of soils.	44	Subsidence of peat soils in the Everglades region of Florida.	25
Estimation of exchangeable cations in soils with the Beckman flame spectrophotometer.	13	Teaching youth to save the soil.	23
Gray wooded soils in parts of Alberta and Montana.	65	The evaluation of soils and the definition of quality classes from studies of the physical properties of the soil profile in the field.	28
How valuable are the soils of central Illinois.	61	The measurement of oxygen diffusion in the soil with a platinum micro-electrode.	68
Influence of liming materials on pH values of six Maryland soils.	47	The morphology and genesis of the gray-brown podzolic and related soils of eastern Canada.	7
Inventorizing soil improvement.	49	The net worth of our northeastern soils.	61
Laboratory evaluation of desert soils for irrigation.	54	The titanium content of Hawaiian soils and its significance.	2
Microbial turnover of phosphorus in soils.	5	Zonal soils in the transition region between the podzol and gray-brown podzolic regions in Michigan.	66
Molybdenum content of typical soils and plants of the Hawaiian Islands.	8	SOIL ACIDITY	
Movement and effect of lime and gypsum in soil.	47	Influence of soil acidity on absorption of calcium by alfalfa as revealed by radiocalcium.	47
Phytase activity in soils.	43	Residual effects of phosphorus in soil at different pH levels as measured by yield and phosphorus uptake by oats.	12
Properties of soil which influence wind erosion: IV. State of dry aggregate structure.	38	SOIL FERTILITY	
Properties of soil which influence wind erosion: V. Mechanical stability of structure.	37	Soil fertility and pastures.	28
Red-yellow podzolic soils of the southeastern United States: I. Morphology of the Ruston, Stephensville, Boswell, Windthorst, Cahaba, Leaf, and Axtell series.	33	Soil-fertility losses by erosion.	17
Red-yellow podzolic soils of the southeastern United States: II. Character of the clay fraction of Ruston, Stephensville, Boswell, Windthorst, Cahaba, Leaf, and Oxtell.	33	SOIL MOISTURE	
Release of potassium from non-exchangeable forms from size fractions of several Iowa soils.	3	A basic concept of equilibrium moisture.	39
Root channels and roots in forest soils.	5	A continuous supply of soil moisture to the growing crop gives highest yield.	9
Root mortality of shortleaf and		A technique for measuring soil-moisture tension in rapidly changing systems.	34
		Determination of soil moisture by neutron scattering.	64
		Estimating the irrigated soil moisture tension in the root zone of growing crops.	63
		Limitations in the use of electrical resistance soil moisture units.	37
		Soil hardness measurements in relation to soil moisture content and porosity.	2
		The conservation of soil moisture in southern Saskatchewan.	43
		Thermodynamics of soil moisture.	18

	Page		Page
SOIL STRUCTURE		eroded, shallow soil, before and after revegetation with native grasses.	10
A new concept - Using chemical for soil structure improvement.	61		
SOIL SURVEY		The Missouri farm water-management plan.	17
Soil survey as a basis for equalization of rural assessments.	11	TILLAGE	
SOLAR RADIATION		Comparative tillage tests at East Lansing, Michigan.	60
The normal pattern of solar radiation at East Lansing, Michigan.	59	Effect of tillage depth on soil conditions and cotton plant growth for two Alabama soils.	51
SOYBEANS		Mulch tillage: Some effects on plant and soil properties.	70
Effects of organic mulches on soil conditions and soybean yields.	19		
Seeding grass in the row with soybeans reduces soil erosion.	35	TILTH	
SPILLWAYS		Structure and its influence on tilth of soils.	6
Capacity of box inlet drop spillways under free and submerged flow conditions.	22	VEGETABLES	
SPLASH EROSION		Composition of Florida-grown vegetables: III. Effects of location, season, fertilizer, level and soil moisture on the mineral composition of cabbage, beans, collards, broccoli, and carrots.	30
Measuring soil splash and protective value of cover on range land.	61		
Raindrops and soil erosion.	46	VERMICULITE	
Raindrops puddle surface soil.	61	Factors affecting the interlayer expansion of vermiculite and montmorillonite with organic substances.	69
STREAM FLOW			
An objective look at the vegetation-stream flow relationship.	39	WATER	
SUMMER FALLOWING		A numerical method for solving the flow equation for water in unsaturated materials.	43
Summer fallowing to meet weather risks in wheat farming.	22	A study of the effects of different amounts of water on surface and subsurface irrigation of lettuce.	12
		Consumptive use of water.	26
TECHNIQUE		Cost of water for irrigation on the High Plains.	49
A concept concerning the measurement of available soil nutrients.	59	Microclimate and water vapor exchange at the soil surface.	70
A numerical method for solving the flow equation for water in unsaturated materials.	43	On the storage of water in rocks in Situ.	54
An electrical analogue for the study of diffusion processes with internal gains or losses.	48	Phreatophytes and their relation to water in Western United States.	54
Chromatographic separations of inositol phosphorus compounds.	68	The importance of nitrogen and water in reducing competition between intercrops and corn.	38
Electrophoretic and chromatographic investigations of clay-adsorbed organic colloids: I. Preliminary investigations.	6	Water conservation through elimination of undesirable phreatophyte growth.	55
Flame photometric determination of exchangeable magnesium in soils.	4	Water and timber management.	62
Lime requirement determination of soils.	4	Water in the Southeast.	41
Simple tests for magnesium and calcium in plant material and magnesium in soils.	40	Water report.	27
Some anisotropy and some field methods for measuring permeability.	7	WATERSHED	
The aspergillus niger method for determining copper in soils.	44	A suggested method for estimating runoff - Part I. Applied to single-unit watersheds.	26
Use of dithizone as an extractant to estimate the zinc nutrient status of soils.	63	An approach to watershed protection criteria.	13
TERRACES		Conservation farming on experimental watershed increases farm income.	36
Are point rows necessary on terraced land?	35	Effect of farm woodland grazing on watershed values in the southern Appalachian Mountains.	45
Erosion controlled by terraces.	26		
Terraces on grassland: A study of terraced and unterraced areas on			

	Page		Page
Medicine Creek Watershed investigations status Report No. 1	43	pheno when applied as a residual pre-emergence herbicide.	34
Parameters for relating unit hydrographs to watershed characteristics.	8	The use of chlordane for the control of crabgrass.	31
Planning the watershed.	41	WELLS	
Plant and soil and water relations on the watershed.	45	Effect of well screens on flow into wells.	44
Progress report on the wooded watershed of the Michigan Hydrologic Research Station.	60	Irrigation wells and well drilling.	10
Putting the watershed plan to work.	41	WHEAT	
The watershed - Using it as a basis for soil and water conservation - getting the facts through surveys and investigations.	41	Comparisons between spray and soil applications of nitrogen on wheat.	51
WATERWAYS		Summer fallowing to meet weather risks in wheat farming.	2
How to make your grassed waterway.	42	WILDLIFE	
WEATHERING		Making land produce useful wildlife.	24
How farmers make pasture plans to meet the uncertainty of weather.	59	Shrub plantings for soil conservation and wildlife cover in the northeast.	24
Weathering sequence of clay-size minerals in soils and sediments:		WILTING	
II. Chemical weathering of layer silicates.	1	Effect of salinity on moisture content and freezing-point depression of soil at permanent wilting of plants.	12
WEED CONTROL		WIND EROSION	
Both cultural and chemical practices needed to prevent crabgrass in lawns.	52	Mechanics of wind erosion.	24
Brush and weed control investigations on rangeland of the Southern Great Plains.	49	Properties of soil which influence wind erosion: IV - State of dry aggregate structure.	38
Chemical control of crabgrass in special purpose turf.	56	Properties of soil which influence wind erosion: V - Mechanical stability of structure.	24
Chemical control of established Johnson grass on non-cultivated land.	23	The effect of cultivation on erodibility of soils by wind.	2
Chemical weed control in field crops.	13	The effects of plant residue cover and clod structures on soil losses by wind.	3
Chemicals take over cotton weeding.	63	WOODLAND	
Chemical weed control in cotton.	57	A longleaf pine thinning study.	36
Control of extensive infestation of bindweed in northwest Texas.	14	Control of growing stock in even-aged stands of conifers.	17
Control of seedling grass in cotton.	30	Forest planting sites in north Mississippi and west Tennessee.	9
Mesquite seed and seedling response to 2,4-D and 2,4,5-T.	57	From field to forest - A 50-year record.	17
Quality and quantity of seed from bitterweed killed with herbicides.	56	Planting in the Appalachian spruce-fir type.	11
Rada for algae.	27	Post oak and blackjack oak.	59
Response of wyethia to 2,4-D.	58	Preliminary guide to reseeding pinyon-juniper lands of western Colorado.	20
Short cuts to weed killing calculations: Part 6 - Preparing weed-killing solutions with liquid.	27	Reclaiming Illinois strip coal lands by forest planting.	61
Short cuts to weed-killing calculations. Part 7 - How to prepare weed killers for woody plants.	29	Site index of oaks in relation to soil and topography in northeastern Iowa.	18
Short cuts to weed killing calculations: Part 8 - How to apply aromatic solvents to control waterweeds.	30	Soil rehabilitation under eastern red cedar and loblolly pine.	36
Short cuts to weed killing calculations: Part 9 - Calibrating the rig for aromatic solvents applications.	31	Some physical and mechanical properties of American beech.	22
The decomposition of a pentachloro-		Stand density as a factor in estimating white oak site index.	12
		Tree and shrub investigations in the southern Great Plains.	18
		Woodland forage in the Arkansas Ozarks.	35

WEATHERING SEQUENCE OF CLAY-SIZE MINERALS IN SOILS AND SEDIMENTS: II. CHEMICAL WEATHERING OF LAYER SILICATES.

By M. L. Jackson, Y. Hseung, R. B. Corey, E. J. Evans, and R. C. Vanden Heuvel; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 3-6. Jan. 1952.

Studies were made of several clays of soils and other deposits to clarify the nature of weathering of layer silicates. Data obtained by X-ray diffraction, thermal, $R(OH)_n$ sorption, and elemental analyses lead to the proposal of general occurrence of interstratified X-amorphous zones in 2:1 layer silicates. As weathering of true micas proceeds through illite, intermediates, vermiculite, and montmorin, a given K interlayer is rapidly depleted of K along a preferential weathering plane, leading to some degree of expansion. Concurrent hydroxylation by H^+ addition to the octohedral layer together with dealumination accounts for loss of some of the mica layer charge. Increasing proportions of such weathered planes leads to various combinations of X-amorphous and X-crystalline zones typical of illite, vermiculite, and montmorin found in soils and other deposits, accounting for their diffraction properties; internal surface; K, H_2O , and OH contents; and exchange properties. Functional continuity of mineral weathering in Great Soil Groups of China through layer silicates (including kaolinite), gibbsite, hematite, and anatase is demonstrated.

RADIOACTIVE PHOSPHORUS AND THE GROWTH AND METABOLIC ACTIVITIES OF SOIL MICROORGANISMS.

By C. A. I. Goring and Francis E. Clark; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 7-9. Jan. 1952.

Experiments were conducted in quartz sand and in a silt loam to determine effect of differing levels of P^{32} on the growth and metabolic activity of soil microorganisms. Determinations were made of carbon dioxide evolved and of numbers of microorganisms, and in some experiments, of amounts of soluble phosphate, nitrate, and ammonia.

In quartz sand treated with phosphorus, dextrose, urea, and mineral salts, and with differing amounts of P^{32} , activity levels of 0.005 and 0.05 mc gave no appreciable differences. At 0.5 mc, P^{32} per mg. of P^{31} , the rate of CO_2 production was reduced during the first week, and differences in the soil flora were encountered. Recovery in CO_2 production then followed, but the soil flora differences persisted throughout 3 weeks of incubation.

In Seymour silt loam treated with 0.5 mc. of P^{32}

per mg. of P^{31} , there was found no influence on microbial numbers or on carbon dioxide evolution, but the amounts of soluble phosphate, ammonia, and nitrate at the end of 3 weeks were lower than for 0.05-, 0.005-, or 0-mc levels of treatment. When the phosphorus treatment was supplemented with dextrose and urea, no differences in the P or N status of the aliquots could be demonstrated. With dextrose and urea added and a 5.0-mc level of activity, there was only slight reduction in CO_2 evolution and only slight differences in microbial numbers.

THE INFLUENCE OF CLAY MINERALS ON THE ENZYMATIC HYDROLYSIS OF ORGANIC PHOSPHORUS COMPOUNDS.

By Max M. Mortland and J. E. Gieseking; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 10-13. Jan. 1952.

Organic phosphorus compounds contain a large portion of the total phosphorus in many soils. The release of phosphate from the organic form is thought to be enzymatic in nature. Since clays compose an active and important part of the soil, a study was made of their effect on the enzymatic hydrolysis of several organic phosphorus compounds.

The effect of clays on the enzymatic hydrolysis of fructosediphosphate, phytin, glycerophosphate, and lecithin was studied. The enzymes were prepared from bread yeast, wheat bran, bread yeast, and kidney cortex, respectively. The various clays studied included kaolinite, Wyoming bentonite (montmorillonite), Swygert (illite), and Cisne (a clay similar to Putnam). The activity of the enzyme was determined with no clay present, and then in the presence of various amounts and kinds of clays. The enzymatic reactions were performed paying special attention to the control of pH, temperatures, inhibitors, activators, and concentrations. The difference between the activity of the enzyme on the organic phosphorus compound in the presence of a suitable buffer and the activity in the presence of clays was considered a measure of the influence of the clay upon the enzyme activity. All of the clays used in this study exhibited an inhibiting influence upon the enzymatic hydrolysis of the organic phosphorus compounds. The amount of inhibition varied with the kind of clay according to the following series: Wyoming bentonite (montmorillonite) - Cisne (Putnam-like clay) Swygert (illite) kaolinite.

The inhibition of phosphatase activity by clays is roughly proportional to the base exchange capacity of the clay. A constant, evaluated for each clay in an empirical equation which describes hydrolysis of the organic compound in the presence of varying quantities of clay, is

approximately equal to the ratios of the base exchange capacities of the various clays. The study indicates that the inhibition is due to the effect of the clay on the enzyme and not to adsorption of the organic phosphorus compound by the clay.

SOIL HARDNESS MEASUREMENTS IN RELATION TO SOIL MOISTURE CONTENT AND POROSITY.

By V. C. Jamison and H. A. Weaver; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 13-15. Jan. 1952.

A method of adjusting penetrometer measurements so as to express soil porosity conditions is presented. The best simple function giving high correlations with macroporosity in the Decatur clay and the sandy clay subsoil of Greenville fine sandy loam was $\log(eH^{1/2})$ where e was field moisture percentage and H the hammer blows required to cut a soil core. The hardness function can be used to estimate macroporosity and compares favorably with the latter in relationship to depth of rooting, growth, and height of cotton plants.

THE TITANIUM CONTENT OF HAWAIIAN SOILS AND ITS SIGNIFICANCE.

By Donald Sherman; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 15-18. Jan. 1952.

A study has been made to determine the titanium oxide content of typical soils of each great soil group occurring in the Hawaiian Islands. The nature of the occurrence of titanium oxide and its relationship to soil formation was investigated.

The titanium oxide content of Hawaiian soils ranged from 2.5 to 25.0 percent. The titanium oxide content is higher in the surface horizon in the soils which are developed under a climate having an alternating wet and dry season. The greatest accumulation was found in the soils belonging to the Humic Ferruginous Latosols, which occur in areas having an alternating wet and dry season but adjacent to the tropical rain forest. Titanium oxide accumulates in tropical soils under the same conditions that iron oxide accumulates. It is easily dehydrated at or near the surface to form concretions, coatings to surfaces of aggregates or soil particles, or as a massive horizon. Titanium oxide, as anatase, rehydrates slower than iron oxide and is more resistant to reduction when the soil internal drainage becomes poorer. Under extreme reducing conditions titanium oxide will be reduced and will be leached from the soil. Under certain conditions of poor drainage the iron and titanium oxides are reduced and removed by leaching, and the aluminum

oxide, gibbsite, is resilicated to kaolinite.

THE EFFECT OF CULTIVATION ON ERODIBILITY OF SOILS BY WIND.

By W. S. Chepil, C. L. Englehorn, and A. W. Zingg; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 19-21. Jan. 1952.

Physical and chemical analyses of the soil samples chosen at random from over 90 fields from western Kansas during 1949 and 1950 were made to determine the rates of soil deterioration that are associated with the type of agriculture employed since the breaking of the virgin sod.

In land that has been utilized for grain production for 19 years about 9 inches of topsoil, constituting all of the A horizon, has been removed, mainly by wind erosion. This land is now much less productive and contains substantially less organic matter and less undecomposed crop residues than the newly broken land. Due to lower amounts of crop residue this "old" cultivated land is more exposed to erosion by wind and water. The soil itself, however, is more resistant to erosion now than when it was first brought under cultivation, due to the presence at the surface of the finer textured and more structurally developed soil of the original B horizon. When the protective influence of crop residues was discounted, the old cultivated land was found to be less than half as erodible as land broken out of virgin sod between 1946 and 1948. With crop failures such as occur on all types of land in dry years, the recently broken land would apparently become most vulnerable to erosion by wind.

DISAPPEARANCE OF 2,4-DICHLOROPHENOXYACETIC ACID AND 2,4,5-TRICHLOROPHENOXYACETIC ACID FROM SOIL.

By A. S. Newman, J. R. Thomas, and R. L. Walker; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 21-24. Jan. 1952.

2,4-D was incubated in the laboratory with different depths of Duffield silty clay loam, and its disappearance therefrom was determined by a cucumber-root elongation test. The lag period before onset of decomposition and the time required for complete decomposition of 2,4-D increased with depth. The lag period varied from 12 days in the 0- to 6-inch sample to 42 days in the 18- to 21-inch sample. On retreatment with 2,4-D the differences among the depths were much smaller than with the original treatment.

Disappearance of 2,4-D and of 2,4,5-T under field conditions was studied in plots treated with these compounds at rates of 0.0, 0.2, 1.0, and

2.5 grams per square yard in 1949, and retreated with one gram per square yard in 1950. 2,4,5-T persisted more than 19 weeks; its persistence was not influenced by previous treatment. The effective concentration of 2,4-D was reduced more rapidly in soils in which it had decomposed previously. This compound persisted 5 and 6 weeks, respectively, in plots which had and had not been treated previously. A substance which stimulated root elongation of cucumber was produced during the decomposition of 2,4-D.

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RELEASE OF POTASSIUM FROM NONEXCHANGEABLE FORMS FROM SIZE FRACTIONS OF SEVERAL IOWA SOILS.

By P. F. Pratt; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 25-29. Jan. 1952.

Surface samples of 13 Iowa soils were fractionated into six size fractions. K release from nonexchangeable forms from these size fractions was measured by an extraction for 10 minutes with boiling 1.0 N HNO_3 . The K release to HNO_3 per unit weight was highest in the 0.2- to 2-micron fraction for 12 of the 13 soils, was highest in the 0.2-micron fraction for one soil, and decreased with increase in particle size in the silt fractions. For each of six size fractions the release per unit weight was correlated with release from the whole soil.

The calculated percentage distribution of K release among the size fractions suggested that the clay fractions contributed about 60 percent and the coarser fractions contributed about 40 percent of the K release from the whole soil.

For eight soils the lowest total K was in the 0.2-micron fraction and the highest total K was in the 2- to 5-micron fraction.

The percentage of the total K which was soluble in HNO_3 was highest in the 0.2-micron fraction and decreased with increase in particle size. The percentage solubility of K in the clay fraction was not related to the degree of weathering of the soils, but the percentage solubility in the silt fractions was closely correlated with degree of weathering.

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THE EFFECTS OF PLANT RESIDUE COVER AND CLOD STRUCTURE ON SOIL LOSSES BY WIND.

By C. L. Englehorn, A. W. Zingg, and N. P. Woodruff; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 29-33. Jan. 1952.

Tests were conducted in the field to determine the interrelationships of surface drag, surface roughness, plant-residue cover, percent of soil material less than 0.42 mm. in diameter, and soil loss obtained by means of a portable wind tunnel.

The tests were conducted at Garden City, Colby, and Manhattan, Kans., on plots prepared especially to obtain a range in residue cover over a range in soil structure.

The data obtained were analyzed according to standard multiple regression and correlation procedure and presented in terms of regression equations. The exponential regression equations provided a satisfactory expression of the functional relationships. Factors effecting variation in results between the different locations were cited.

The regression equations illustrate the effect of each factor on soil loss. On the basis of relationships secured at three locations, an exponential equation approximating the results of the tests as a whole was developed. In this equation, soil loss, X, in pounds per acre is shown to vary directly as the 2.5 power of the surface drag of the wind and the 3.5 power of the percent of soil fractions less than 0.42 mm. in diameter. It varied inversely as the 0.8 power of the weight of surface residue. A simplified clod structure-residue index of soil loss, wherein the surface drag of the wind is held constant at 3,000 pounds per acre, is presented.

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HYDRAULIC GRADIENTS DURING INFILTRATION IN SOILS.

By R. D. Miller and Felix Richard; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 33-38. Jan. 1952.

A technique for direct measurement of hydraulic head in rapidly changing systems was applied to the infiltration of water into artificially packed columns of dry soil including three California soils and a sample of silica flour. Results indicate that the transmitting zone in each soil was a region of relatively uniform hydraulic gradient which was greater than unity but decreased with time and might approach unity as a limit. At corresponding stages of infiltration, the magnitudes of the gradients in the transmitting zones differed for the various materials.

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WEIGHT AND NITROGEN AND CALCIUM CONTENT OF THE ANNUAL LITTER FALL OF FORESTS IN THE SOUTH CAROLINA PIEDMONT.

By Louis J. Metz; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 38-41. Jan. 1952.

The annual fall of litter was measured in stands of pine, mixed pine-hardwood, and hardwood in the South Carolina Piedmont. The total amount of litter (including twigs, bark, and fruit) dropped annually ranged from 4,059 to 5,619 pounds per acre on an oven-dry basis. Considering leaf

fall alone, the annual drop ranged from 3,938 pounds in a 30- to 40-year-old stand of shortleaf pine to 4,476 in a 25-year-old loblolly pine stand.

The content of nitrogen, calcium, and magnesium in freshly fallen leaves was determined for 14 tree species. The foliage of both loblolly and shortleaf pines was found to contain less of these elements than any of the hardwood species. Based on these chemical determinations and the annual leaf fall, estimates are given of the total amount of these nutrients returned to the forest floor by the annual leaf fall in the nine stands studied. The hardwood stands were found to return about twice as much nitrogen, three times as much magnesium, and five times as much calcium in their leaf fall as did the pine stands. Information given as to the nutrient content of the common forest species and on the litter fall of representative stands can be used by the forester to evaluate the effect of his management practices upon soil conditions.

LIME REQUIREMENT DETERMINATION OF SOILS.

By D. K. Patel and E. Truog; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 41-44. Jan. 1952.

A method is proposed for determining the amount of lime needed under field conditions to bring acid soils to the neutral point. In this method a sample of soil is treated with a measured amount (always an excess) of standard calcium-bicarbonate solution. After evaporation followed by wetting with water and a second evaporation, the excess of calcium bicarbonate which was added, now in the form of CaCO_3 , is determined by means of the Collins' Calcimeter. This instrument measures the CO_2 evolved when the sample is treated with dilute HCL. From the volume of CO_2 evolved, the excess of carbonate added and by difference the amount that reacted with the soil, the lime requirement, are calculated. The results obtained with several soils check closely with those obtained in field-plot tests where varying amounts of lime were added.

FORMATION OF MIXED LAYER MINERALS BY POTASSIUM FIXATION IN MONTMORILLONITE.

By R. S. Dyal and S. B. Hendricks; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 45-48. Jan. 1952.

The amount of ethylene glycol retained by a clay is used as an index of interlayer swelling. Potassium montmorillonites after drying at 100°C . show markedly lower glycol retention than do calcium and hydrogen montmorillonites. X-ray diffraction data indicate that these potassium

clays are in part unsolvated between silicate layers, and in part solvated with two layers of ethylene glycol.

MOISTURE HYSTERESIS IN GYPSUM MOISTURE BLOCKS.

By C. B. Tanner and R. J. Hanks; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 48-51. Jan. 1952.

The pressure membrane apparatus was modified by running water between the membrane and the screen plate so that both the drying (release) curve and wetting (intake) curve could be measured in gypsum moisture blocks over the equivalent moisture-tension range of 0.0 to 8.4 atmospheres. The difference between release and intake curves, termed moisture hysteresis, for five blocks, was considerable: a block resistance of 6,200 ohms corresponded to any moisture tension from 1.16 to 2.50 atmospheres; a block resistance of 23,000 corresponded to any tension from 2.45 to 4.65 atmospheres; a block resistance of 58,000 corresponded to any tension from 4.70 to 7.40 atmospheres, with all tension ranges depending upon past moisture history. The method appears suitable for measuring hysteresis in gypsum blocks and soils over the entire pressure range to which the pressure membrane apparatus can be operated.

FLAME PHOTOMETRIC DETERMINATION OF EXCHANGEABLE MAGNESIUM IN SOILS.

By C. I. Rich; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 51-55. Jan. 1952.

The Beckman flame spectrophotometer was studied to determine its application to the determination of magnesium in soil extracts. A high flame temperature and a narrow slit width increased the intensity of mg. (2852 Å) relative to the flame background. Centrifuging satisfactorily cleared extracts and prevented most clogging of the atomizer. Fe, Ca, and Na caused significant interference at the mg. band head of 3708 Å particularly with mg. concentrations below 2.00 ME/100 ml. At the 2852 Å line, Ca in concentrations greater than 8 ME mg/100 ml depressed the mg. intensity; Al or PO_4 in concentrations greater than 100 ppm. Al or P slightly depressed the mg. intensity, whereas Na in concentrations greater than 10 ME/100 ml increased the intensity. Other elements tested (K, Mn, Fe, S and Si) at 2852 Å had no apparent effect within concentration ranges usually found in ammonium acetate (1N) and 0.05N HCL soil extracts. Twenty-four different soils of Virginia were analyzed for exchangeable magnesium by the photometric method, and results did not differ significantly (5 percent level) from the chemical method. The average recovery of mg. added to 0.05N HCL extracts

was 103 percent and the standard deviation was 5.3 percent. The most favorable instrumental conditions found were: wave length, 2852 Å; slit width, 0.15 mm; propane pressure, 2.0 cm. toluene; oxygen pressure, 75 inches H₂O; air pressure, 18 pounds per square inch; sensitivity control, about one turn from the counterclockwise limit. The intensity scale was set on 100 when a solution containing 2.0 ME mg. per 100 ml. was atomized and the milliammeter needle brought to zero with the sensitivity control.

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MICROBIAL TURNOVER OF PHOSPHORUS IN SOIL.

By D. D. Johnson and F. E. Broadbent; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 56-59. Jan. 1952.

The phosphorus cycle in soils has been shown to be closely related to the carbon and nitrogen cycles. The investigation reported is an attempt to evaluate the effect of the energy status of the soil on this phosphorus cycle. A concept of a metabolic pool in the soil from which microbial, plant, and chemical processes take inorganic phosphorus is presented. The addition of radioactive phosphorus to this pool and its subsequent uptake by the soil processes would allow the various fractions of the soil phosphorus which are actively turning over to be identified. The procedure used to evaluate this theory involved the addition of radiophosphorus and incubation of soil samples for various periods of time, after which the soil was leached with acid and then treated with cold and hot alkali solutions, the alkali solutions being further fractionated by the addition of acid. Total phosphorus and total radiophosphorus were determined on all fractions. The analysis of the data shows that certain of these soil phosphorus fractions undergo rapid turn-over. The possible importance of these rapidly turning-over fractions to the growth of higher plants is suggested.

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BORON CONTENT OF ALFALFA AS INFLUENCED BY BORON SUPPLY.

By W. T. Dible and K. C. Berger; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 60-62. Jan. 1952.

The object of this investigation was to explain the variations in the boron content of boron-deficient alfalfa and to outline a procedure for sampling plants which will give a more accurate measure of the plant boron status.

Alfalfa, grown in nutrient solutions where the boron was excluded during a stage of active elongation of the plant, contained 8 p.p.m. of boron in the apical part of the shoot and 23 p.p.m. in the total shoot. Plants receiving a continuous

supply of boron had equal distribution in apical and basal parts of the shoot. In field experiments, as the available soil moisture became limiting in the surface foot of soil, the boron content of the apical leaves of the alfalfa shoot was decreased from 30 to 20 p.p.m. while the boron content of the bottom leaves remained at 30 p.p.m. Apical portions of boron-deficient plants in several fields contained about 8 p.p.m.

Because of the immobility of boron in the alfalfa shoot, a sharp reduction of boron supply can result in boron-deficiency symptoms on alfalfa plants with relatively high amounts of boron in the total shoot. Therefore, the indicative analysis is of the apical part of the alfalfa shoot.

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ROOT CHANNELS AND ROOTS IN FOREST SOILS.

By R. N. Gaiser; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 62-65. Jan. 1952.

The frequency, size, and stages in the development of vertical channels formed in the soil through the decay of the roots of hardwood trees are reported for a site located in southeastern Ohio. Data were obtained by exposing the soil profile by trenching. A diagram was prepared showing the location of root channels and living roots. Additional data on channels were obtained by probing the soil with a flexible wand to locate regions of low resistance which indicated the presence of vertical root channels. The vertical channels found exceeded 4,000 per acre. The estimate is low because not all channels could be discovered by the means employed. It is likely that vertical channels are interconnected by lateral channels formed by decayed root systems. Because channels contain materials relatively more permeable to water than the surrounding soil horizons, it is probable that the channels serve as pathways for the rapid movement of a large part of the free water in the soil profile.

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EFFECT OF MANAGEMENT ON SOIL PERMEABILITY.

By C. A. Van Doren and A. A. Klingebiel; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 66-69. Jan. 1952.

The purpose of this study was to determine some changes that have taken place in the surface of cultivated soils. Permeability, volume weight, and percent of pores drained were determined on virgin soils, fertilized and unfertilized soils, soil farmed to a good rotation in contrast to a poor rotation, and eroded soils as compared to slightly eroded soils. Some studies were also made on the effect of cultivation on percent aggregation. Six different soils were studied

in the State.

Undisturbed core samples were taken at random with a steel cylindrical sampler and analyzed for permeability, volume weight, and pores drained. Most samples were taken from corn fields in the fall of the year.

Infiltration values for soil with various mulch covers were secured in the field with a type-F infiltrometer.

The surface of most soils was originally moderate to moderately rapid in permeability. The addition of limestone and fertilizers has increased the permeability rate of the soil as compared to the untreated plots. This response may be attributed to increased growth of plants. The percentage of large aggregates (1.0 mm) in the surface soil of cultivated areas was reduced from 4 to 20 times as compared to virgin areas. Surface samples taken from plots farmed to a corn, oats, clover, wheat (clover) rotation were 16 times more permeable and held 17 percent more available water than samples taken from plots farmed to a corn, corn, corn, soybean rotation. Severely eroded soils were less permeable than moderately eroded soils. Wheat straw and crop residues increased infiltration rates approximately three times as compared to bare ground, no mulch.

ELECTROPHORETIC AND CHROMATOGRAPHIC INVESTIGATIONS OF CLAY-ADSORBED ORGANIC COLLOIDS: I. PRELIMINARY INVESTIGATIONS.

By F. J. Stevenson, Joy D. Marks, J. E. Varner, and W. P. Martin; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 69-73. Jan. 1952.

The purpose of this study was to determine the nature and composition of the organic colloids extracted from Brookston clay with neutral sodium pyrophosphate solution. The number of electrically homogeneous organic colloids present on the clay was determined electrophoretically. Some of the amino acids and monosaccharides in the hydrolysate of the colloids were identified by paper chromatography.

It was found that the colloidal extract consisted of one main component, a brownish-black material, with a second present in small concentration. The electrophoretic mobility of the second component corresponded closely to that of nucleoproteins.

Eight amino acids: aspartic acid, glutamic acid, glycine, serine, threonine, alanine, valine, and leucine, were identified. Two sugars, galacturonic acid and xylose, were also present together with an unidentified spot which was probably a mixture of mannose, arabinose, glucose, and galactose. Traces of ribose and glucurone

were detected.

MICROSCOPIC CHANGES IN SOIL STRUCTURE DURING COMPRESSION.

By Paul R. Day and George G. Holmgren; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 73-77. Jan. 1952.

Compressed specimens of soil were examined microscopically to determine the nature of the changes occurring in moist soil during the application of pressure. A small compression chamber was filled loosely with moist soil aggregates, and the pressure was applied gradually in a controlled manner. The compressed material was removed at various stages and dried. Polished sections were then prepared. The results have been preserved in a series of photomicrographs and show that the volume changes are attributable in large part to plastic deformation of the aggregates. Deformation occurred readily at the lower plastic limit, causing a progressive closing of the interaggregate spaces as the pressure was increased. At water contents below this limit deformation appeared to be localized in the areas of contact between aggregates and consisted mainly of flattening of the aggregates against one another. The incomplete closing of the interaggregate spaces at low-water contents was attributed to the increased shearing strength of the material. The theory has been advanced that during compression localized stresses in excess of the shearing strength occur in the contact areas between aggregates and that the resulting flattening causes a diminution of stress on account of the distribution of the load over a greater area; deformation ceases when the shearing stress falls below the shearing strength. According to this theory, the flattening phenomenon acts as a check against unlimited deformation at any given pressure.

STRUCTURE AND ITS INFLUENCE ON TILTH OF SOILS.

By A. A. Klingebiel and A. M. O'Neal; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 77-80. Jan. 1952.

The purpose of this study was to determine some of the changes that have taken place in the structure of several Corn Belt soils and its influence on tilth, permeability, volume weight, and percent of pores drained.

Samples of soil were examined in the field to determine the type, class, and grade of structure, direction of natural fracture when lumps were broken, and size and number of visible pores. Six to 12 undisturbed soil core samples 3 inches thick and 3 inches in diameter were taken at random from each plot and depth to determine

permeability, volume weight, and percent of pores drained at 60 centimeters tension.

Many surface soils that originally were granular or crumb in structure have changed through cultivation and poor management practices to a fine fragmental or massive structure. With these changes in structure the percolation rate decreased from 8.4 inches to 0.2 of an inch per hour, percent of pores drained was reduced from 9.2 to 3.5, and the volume weight increased from 1.1 to 1.31.

The surface crust was the least permeable layer in the upper 18 inches of the soils studied.

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THE MORPHOLOGY AND GENESIS OF THE GRAY-BROWN PODZOLIC AND RELATED SOILS OF EASTERN CANADA.

By P. C. Stobbe; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 1, pp. 81-84. Jan. 1952.

The purpose of this investigation was to establish the range in characteristics of the Gray-brown Podzolic soils of eastern Canada and to characterize the different kinds of Gray-brown Podzolic profiles. It was based on a comparative study of the morphological and some chemical characteristics of all the soil series of this group which have been recognized to date in Canada.

The Gray-brown Podzolic soils in eastern Canada occur only on calcareous materials, and their maturity of development can be correlated with the length of time they have been subjected to weathering. They have mull-like, neutral to moderately acid, A₁ horizons, comparatively thick but only slightly to moderately unsaturated A₂ horizons and B₂ horizons which contain more clay and sesquioxides than the other horizons of the profile.

A number of intergrade Gray-brown Podzolic types, which possess some characteristics of the other groups in the region, have been characterized. The findings suggest that the cycle of profile development on calcareous materials in this region is from Brown Forest to Gray-brown Podzolic to Brown Podzolic and Podzol soils.

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SOIL AGGREGATE FORMATION.

By J. H. Stallings; USDA, SCS-TP-110. April 1952.

A review and analysis are presented of the most important literature dealing with the method of soil aggregate formation. It is shown that under some conditions clay may act directly as a binding agent in forming aggregates. However, most of the data presented indicate that aggregate

formation in soils is associated with adequate supplies of biologically active organic matter and that substances produced or synthesized by microorganisms play an active part. More specifically, the humate fraction of the organic colloids produced in the course of decomposition of organic matter by soil microorganisms appears to be one of the main -- if not the chief -- factors contributing to the formation of soil aggregates. They presumably are negatively charged hydrophilic colloids and are distributed uniformly through the soil aggregates. These substances are adsorbed to colloidal clay particles, perhaps by electrochemical union with inorganic colloids. Apparently they are bound through the carbon linkage "bridge" between reactive groups on the polymer. The presence of small amounts of sodium, calcium, magnesium, and other cations increases the aggregating effect with low concentrations of humate fractions.

Locked to the dirt particles, the humate fraction or hydrophilic colloids, act like bridges between them, keeping them from separating yet at the same time holding them at arm's length so they won't pack down tight.

Since certain other groups of soil microorganisms break down these organic colloids as they are formed, it is necessary to maintain a continuous supply of fresh organic matter in the soil if a high state of aggregation is to continue. This can be accomplished by using sod cover or mulches to which fresh materials are added frequently.

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SOME ANISOTROPY AND SOME FIELD METHODS FOR MEASURING PERMEABILITY.

By Ronald C. Reeve and Don Kirkham; Trans. Amer. Geo. Union, Vol. 32, No. 4, pp. 582-590. August 1951.

Three field methods -- piezometer, auger hole, and tube -- and the conventional undisturbed-core method for measuring soil permeability are compared theoretically and experimentally. Natural channels in the soil, such as cracks, roots, and worm holes, cause extreme variations in results by the undisturbed core method and cause the rate of rise, in smaller-diameter piezometers, to deviate from the theoretical. This deviation becomes negligible as the pipe diameter is increased. The size of sample associated with each method differs from one method to the other. In non-uniform soils this causes differences in measured permeability values. In anisotropic soils the piezometer and auger methods, using the usual inflow cavities which are long compared to their diameter, measure essentially the horizontal permeability; whereas the tube method, where length of cavity equals zero, measures essentially the vertical. The undisturbed-core method may be used to measure either the horizontal or

vertical permeability depending upon the direction in which the cores are taken. The piezometer method appears to be convenient and valuable for general use because of its suitability for measurement of permeability at any depth in both uniform and nonuniform soils. The auger-hole method is well adapted for measuring permeability in unstratified soils and appears particularly advantageous in soils having many root holes and other natural channels. The tube method, a special case of the piezometer method, with large diameter and a cavity length of zero, is especially useful in measuring essentially the vertical permeability of anisotropic soils. All the methods as described here apply to water-saturated soil below a water table.

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PARAMETERS FOR RELATING UNIT HYDROGRAPHS TO WATERSHED CHARACTERISTICS.

By Charles Grant Edson; Trans. Amer. Geo. Union, Vol. 32, No. 4, pp. 591-596. August 1951.

It is suggested that the physical characteristics of a watershed exert two simultaneous and distinct influences upon the resultant unit hydrograph: one, whereby the runoff is brought to the valley; the other, in getting the runoff through the mouth. An empirical equation based on this thesis results in two parameters which are readily expressible in terms of the peak discharge and the time of peak. Between these two sets of parameters, the functional relationship is sufficiently complex to rob the latter set of any direct tie-in with the watershed characteristics. Herein lies a possible explanation of the general failure encountered in correlating watershed characteristics with peak discharge and time of peak. It is hoped that the proposed parameters may be more successful in bringing about this much-sought-after correlation.

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EVALUATION OF TWO ELEMENTS AFFECTING THE CHARACTERISTICS OF THE RECESSION CURVE.

By Carroll F. Merriam; Trans. Amer. Geo. Union, Vol. 32, No. 4, pp. 597-600. August 1951.

This is an entirely empirical approach to the problem of evaluating two factors which play dominant parts in determining the shape which the runoff recession curve would take if we assumed no subsequent rainfall. One of these is the depletion of ground-water storage and the other the draining away of that portion of the runoff which behaves as though it never enters the ground. The two apparently influence the actual recession curve independently of each other so that, by knowing the characteristics of each, the combined effect may be predicted. The application of envelope curves is demonstrated

for the purpose of elimination of variables which may be considered statistically to approach zero as a limit.

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ONE HUNDRED QUESTIONS AND ANSWERS ON LIMING LAND.

By John Axley; Md. Agr. Expt. Sta. Bul. A-60. March 1951.

The purpose of the bulletin is to present answers to the many questions that arise in men's minds about liming the soil. The answers were agreed upon in conference after review of the most important evidence available.

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MOLYBDENUM CONTENT OF TYPICAL SOILS AND PLANTS OF THE HAWAIIAN ISLANDS.

By Giichi Fujimoto and G. Donald Sherman; Agron. Jour., Vol. 43, No. 9, pp. 424-429. September 1951.

The molybdenum content of Hawaiian soils ranged from 8.9 to 73.8 p.p.m. with an average volume of 25.8 p.p.m. The molybdenum content of plants was found to range from 0 to 2.50 p.p.m. The low content of molybdenum found in plants grown in certain areas suggests that a possible deficiency of this element might occur in some areas.

There was a slight correlation between the amount of molybdenum in the plants and that in productive soils where the reaction is neutral or slightly alkaline. The highest molybdenum content in plants was found in those grown on dark magnesium clay, gray hydromorphic, and paddy soils. It was concluded that the plant materials grown in Hawaiian soils do not contain sufficient quantities of molybdenum to cause scouring disease among cattle.

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BLAST FURNACE SLAGS AS AGRICULTURAL LIMING MATERIALS.

By O. R. Carter, B. L. Collier, and F. L. Davis; Agron. Jour., Vol. 43, No. 9, pp. 430-433. September 1951.

The purpose of this study was to determine by greenhouse, field, and laboratory investigations, with particular emphasis on field results, the comparative values of (1) representative blast furnace slags and agricultural limestone, (2) different rates of application of blast furnace slag, and (3) different finenesses of blast furnace slags. In most cases slag was as efficient in crop production as limestone when applied on an equivalent basis.

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A RECALIBRATION OF THE HYDROMETER METHOD FOR
MAKING MECHANICAL ANALYSIS OF SOILS.

By George John Bouyoucos; Agron. Jour., Vol. 43,
No. 9, pp. 434-438. September 1951.

The hydrometer method for making mechanical analysis of soils was recalibrated to conform with the present soil particle size classification. The method makes possible the mechanical analysis of soils in only 2 hours, and the results compare favorably with those of the pipette method. Because of its simplicity an inexperienced operator or even a layman can use the method and obtain reasonably accurate results.

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PERFORMANCE OF STRAINS OF LOTUS CORNICULATUS ON
THE NORTH PACIFIC COAST.

By W. E. Chapin, A. L. Hafenrichter, and A. G. Law; Agron. Jour., Vol. 43, No. 9, pp. 438-442. September 1951.

Five strains of the broadleaf type and two strains of the narrow-leaf type of birdsfoot trefoil and two strains of big trefoil were tested on upland soils at two locations in western Washington. Each strain was grown alone and in alternate rows with orchard grass. The results are reported.

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THE CHEMICAL COMPOSITION OF IRRIGATION WATER
USED IN FLORIDA CITRUS GROVES.

By I. W. Wander and H. J. Reitz; Fla. Agr. Expt. Sta. Bul. 480. July 1951.

This bulletin lists the composition of waters from widely different localities which are used for irrigating or for mixing sprays for citrus.

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TOPDRESSING LEGUME MEADOWS IN IOWA.

By George Stanford and John Hanway; Better Crops with Plant Food, Vol. 35, No. 7, pp. 17-21. August-September 1951.

Topdressing phosphate and potash fertilizers on legume meadows often pays dividends where soils are deficient in these nutrients. Topdressings should supplement rather than substitute for fertilization at seeding time. The initial fertilizer application gives the new seeding the boost it needs for good stand establishment and early vigorous growth. Later applications may be needed on the low-fertility soils where not enough phosphate or potash, or both, were supplied initially.

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SURVIVAL OF WHEATGRASSES ON SAGEBRUSH RANGE
DEPENDS ON METHODS OF SEEDING AS WELL AS WEATHER
CONDITIONS.

By C. Wayne Cook and L. A. Stoddart; Utah Agr. Expt. Sta., Farm and Home Sci., Vol. 12, No. 3, pp. 43 and 58-60. September 1951.

The results of this study indicate that many factors, influence the success or failure of seeding in any one year. Furthermore, the results may vary for different species and for different methods. Even under good soil preparation and planting methods only about 2 to 7 percent of the viable seed planted actually become established.

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A CONTINUOUS SUPPLY OF SOIL MOISTURE TO THE
GROWING CROP GIVES HIGHEST YIELD.

By Sterling A. Taylor; Utah Agr. Expt. Sta., Farm and Home Sci., Vol. 12, No. 3, pp. 50-51, and 61. September 1951.

This article reports on one phase of a larger study on irrigation, fertilization and soil management of crops in rotation. It shows that substantial increases in yield can be obtained by supplying the right amount of irrigation water to the soil before the crop shows signs of moisture depletion.

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FOREST PLANTING SITES IN NORTH MISSISSIPPI AND
WEST TENNESSEE.

By Walter M. Broadfoot; USDA, Forest Service, Southern Forest Expt. Sta. New Orleans, La., Occasional Paper 120. May 1951.

This paper describes the most important sites in the area for forest plantings, predicts what may be expected if they are planted to trees, and suggests the tree species and planting procedures most likely to succeed. Opinions and conclusions are based on field observations during the past 3 years. Majority of these observations were made during detailed study of 159 plantations on which establishment records were available.

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GROUND WATER INVESTIGATIONS ALONG BOGUE PHALIA
BETWEEN SYMONDS AND MALVINA, BOLIVAR COUNTY.

By Tracy Wallace Lusk; Miss. State Geological Survey Bul. 72. Univ. of Miss. 1951.

This is a report of ground-water investigations along Bogue Phalia between Symonds and Malvina, Bolivar County. The purpose was to determine how much water could safely be pumped from the

Bogue by the rice farmers of that area. The Bogue has its source, its entire course, and its end wholly within the level, almost flat, alluvial plain of the Mississippi River. Consequently, only a bit of surface water flows into its channel. Of necessity, therefore, it has to be supplied by ground water. The water comes from the upper 25 or 30 feet of the alluvial fill, for that is the total depth to which the Bogue has sunk its channel.

TERRACES ON GRASSLAND: A STUDY OF TERRACED AND UNTERRACED AREAS ON ERODED, SHALLOW SOIL, BEFORE AND AFTER REVEGETATION WITH NATIVE GRASSES.

By Maurice B. Cox, Harley A. Daniel, and Harry M. Elwell; Okla. Agr. Expt.Sta. Bul. No. B-373. September 1951.

This bulletin reports a study made on two areas of shallow, eroded, abandoned Class VII land where a cover of native grass had been re-established. One plot had been terraced before it was returned to grass. The other was unterraced.

After the grass cover became established, the percentage of runoff was greater on the terraced plot than on the unterraced one. Grass cover was considerably better on the unterraced plot than it was on the one that had been terraced. Forage yield in 1950, the eighth year after grass was established, was more than three times as great on the unterraced plot.

WINTER COVERCROPS.

By B. A. Madson; Calif. Agr. Ext. Service, Cir. 174. June 1951.

This circular explains how a cover crop helps the soil, how to select a cover crop, how to grow one, and how to plow it under.

EFFECTS OF FERTILIZERS UPON THE YIELDS, SIZE AND QUALITY OF ORANGE FRUITS.

By E. R. Parker and W. W. Jones; Calif. Agr. Expt.Sta. Bul. 722. March 1951.

This bulletin reports the effects to date of 44 different fertilizer treatments on the yields, size, and quality of the fruit of navel oranges. Results over a 22-year period are reported. Resulting changes in the soil and trees are summarized to afford a better understanding of the fertilizer effects and thus permit broader application of the results.

CALIFORNIA GRASSLANDS AND RANGE FORAGE GRASSES.

By Arthur W. Sampson, Agnes Chase and Donald W. Hedrick; Calif. Agr. Expt.Sta. Bul. 724. May 1951.

This bulletin provides useful and technical information on the uncultivated or wild grasslands, and the native and naturalized range forage grasses of California.

CUCAMONGA BROME - A NEW GRASS FOR COVERCROPPING.

By Paul E. Lemmon, A. L. Hafenrichter, and B. A. Madson; Calif. Agr. Expt.Sta. Cir. 401. Nov. 1950.

The efficiency of Cucamonga brome has been proved in southern California. Its adaptability to northern California is still being studied, but since the species from which it was obtained grows over a wide range, no difficulty is expected from northern California conditions.

IRRIGATION WELLS AND WELL DRILLING.

By C. N. Johnston; Calif. Agr. Expt.Sta. Cir. 404. May 1951.

This discussion is not offered as a manual for well drillers, but to acquaint farmers with the operations involved in drilling a well. Studying this circular may help potential well owners make reasonable decisions regarding location, drilling, development, and use of a relatively expensive asset.

SOIL CONSERVATION PAYS - EFFECTS OF SPECIFIC PRACTICES ON YIELDS AND ON COSTS.

By H. O. Anderson, P. E. McNall, and O. E. Hays; Univ. of Wis. Ag. Econ. l. August 1951.

Soil erosion and water losses are severe whenever heavy rains fall on long sloping fields that are unprotected by a thick cover of growing crops. Losses vary with the intenseness of the rainfall, steepness and length of slope, and type and condition of soil. It has been impossible to devise a practical means for controlling or changing the character of the rainfall, the steepness of the slopes, or the type of soil. On the other hand, farmers can affect the kind of crops, character of the slopes, and condition of the soil.

A number of studies have shown that crop and livestock productions as well as net incomes are larger on farms where soil conserving systems of farming have been followed than where less

attention has been paid to soil conservation. The greater production usually is due to a combination of changes in land use and in crop-production techniques. While it is important to measure the effect of soil conserving program for a farm as a whole, it is also important to analyze the benefits and costs of some of the parts of the program. Such analysis is helpful in making soil conserving plans for farms because in many instances one soil conserving practice may be substituted in whole or in part for another practice.

SOIL CONSERVATION IN SOUTHWESTERN WISCONSIN.

By H. O. Anderson and P. E. McNall; Univ. of Wis. Ag. Econ. 11. August 1951.

Loss of a large part of the fertile topsoil has been the result of continued cropping of sloping farm lands in southwestern Wisconsin over a period of 60 to 90 years. The change from wheat farming to dairying, which began about 1890, reduced soil losses somewhat but did not solve the erosion problem.

The recommended soil conservation program includes changes in land use, in the placement and proportions of the various types of crops, retiring the steeper lands to woodland and pasture, contour strip cropping, application of commercial fertilizer and lime as needed, the increased use of manure and green manure, and construction of such terraces, dams, and diversion ditches as are necessary to prevent or repair damage from water erosion. It also includes attention to factors such as the care and management of woodlots and plantings for wildlife protection.

Crop yields and total production of feed have increased following the adoption of soil conservation measures. Corn and oat yields were 20 percent higher and hay yields 12 percent higher on the Vernon County Soil Conservation District farms where a conservation system had been in effect 3 years or more than on comparable farms where less attention had been paid to soil conservation. Conservation farms produced about 25 percent more grain.

PROGRESS REPORT NO. 12 OF SILT LOAD OF TEXAS STREAMS (1949-1950).

By Dean W. Bloodgood and James E. Mortensen; Texas Bd. of Water Engineers and USDA, SCS. Austin, Texas. August 1951.

This is the 12th annual progress report made for the purpose of determining the characteristics of the suspended silt load of Texas streams.

MAKING A CREEK FLOW GENTLY.

By Howard Matson; Agr. Eng., Vol. 32, No. 9, pp. 477-480 and 482. September 1951.

This paper discusses the flood problems of creeks and rivers. The Washita River is used as an example.

SOME AGRICULTURAL ENGINEERING PROBLEMS IN SOIL AND WATER CONSERVATION.

By Louis P. Merrill; Agr. Eng., Vol. 32, No. 9, pp. 481-482. September 1951.

The author reviews the accomplishments of agricultural engineers in solving problems in soil and water conservation.

SOIL SURVEY AS A BASIS FOR EQUALIZATION OF RURAL ASSESSMENTS.

By Walter W. Weir; Agr. Eng., Vol. 32, No. 9, pp. 483-485. September 1951.

This article sets forth the advantages of using soil survey data in the determination and equalization of rural land assessments.

OPPORTUNITIES AND NEEDS IN RANGE MANAGEMENT.

By Varnon A. Young; Jour. Forestry, Vol. 43, No. 8, pp. 566-569. August 1951.

The author discusses the opportunities and needs in the field of range management.

PLANTING IN THE APPALACHIAN SPRUCE-FIR TYPE.

By W. G. Wahlenberg; Jour. Forestry, Vol. 49, No. 8, pp. 569-571. August 1951.

Any attempt to reclaim the depleted spruce-fir type for economic timber production can utilize the results of tests of the past decade. Planted on similar sites, the survival of red spruce at 10 years was nearly twice as great as that of red pine, but the height of the surviving spruces was little more than half that of the pine. It is recommended that red pine be planted only on the drier, more exposed situations in the spruce-fir type. It needs deep mineral soil and should have only moderate vegetative competition. Spruce should be planted in the more moist, less exposed situations with soil containing organic matter. It will tolerate relatively shallow, rocky soils, or rather heavy vegetative competition, or both, but will need

release if it is to grow well.

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STAND DENSITY AS A FACTOR IN ESTIMATING WHITE OAK SITE INDEX.

By Richard H. Gaiser and Robert W. Merig; Jour. Forestry, Vol. 49, No. 8, pp. 572-574. August 1951.

Height growth of even-aged white oak is significantly modified by stand density. Site-index curves, corrected for variation in stand density, have been developed for white oak in southeastern Ohio. An example of the use of these curves is presented. The modified site-index curves differ from conventional ones at both statistical and practical levels of significance.

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A STUDY OF THE EFFECTS OF DIFFERENT AMOUNTS OF WATER ON SURFACE AND SUBSURFACE IRRIGATION OF LETTUCE.

By Andres P. Aglibut and Pedro N. Laudencia; The Philippine Agriculturist, University Philippines, Vol. 33, No. 1, pp. 36-45. July-Aug-Sept. 1949.

The purpose of this study was to determine the amount of water most effective in raising lettuce and to compare the effects of surface and subsurface methods of applying irrigation water. The best yield was obtained when plants were supplied with water not lower than 20 percent of the water-holding capacity of the soil. The yield decreased when the water applied exceeded 80 percent. The most economical amount of water was 20 to 40 percent of the water-holding capacity of the soil. Higher yield and more vigorous plants were produced with subirrigation than with surface irrigation.

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RESIDUAL EFFECTS OF PHOSPHORUS IN SOIL AT DIFFERENT pH LEVELS AS MEASURED BY YIELD AND PHOSPHORUS UPTAKE BY OATS.

By Clayton McAuliffe, George Stanford, and Richard Bradfield; Soil Sci. Vol. 72, No. 3, pp. 171-178. September 1951.

The residual effect of phosphorus applied 8 years previous was measured by first sampling yield responses, increased phosphorus content of oats at three sampling dates, and a decrease in the percentage phosphorus from the fertilizer containing radio phosphorus at the sampling periods. Oat yields were increased by an application of 11 pounds of phosphorus in 1949, demonstrating that the residual phosphorus, even at the highest level of phosphorus application in 1941, was insufficient for maximum yields.

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SOLUBILITY OF IRON, ALUMINUM, CALCIUM AND MAGNESIUM INSITOL PHOSPHATES AT DIFFERENT pH VALUES.

By R. H. Jackman and C. A. Black; Soil Sci., Vol. 72, No. 3, pp. 179-186. September 1951.

This study was concerned with the solubility of the iron, aluminum, calcium, and magnesium salts of phytic acid and of a mixture of the lower inositol phosphoric acids at different pH values. It was concluded that insofar as solubility determines the availability of phosphorus in soil inositol, phosphates, agronomic practices designed to maintain the soil reaction at about pH 6 are desirable.

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AMMONIUM FIXATION AND AVAILABILITY IN HOPSTER CLAY LOAM.

By F. E. Allison, Janet H. Doetsch, and E. M. Roller; Soil Sci., Vol. 72, No. 3, pp. 187-200. September 1951.

The purposes of this study were: (a) to obtain information on some of the factors that affect the fixation of ammonium, and (b) to determine the availability of fixed ammonium to nitrifying bacteria. The practical significance of the results obtained is discussed briefly. It is suggested that the occasional failure of crops to recover as high a percentage of added ammonium nitrogen as of nitrate nitrogen may, in some instances, be due to absorption of the ammonium by the clay minerals.

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FREEZING POINT OF WATER IN A SOIL AS RELATED TO SALT AND MOISTURE CONTENTS OF THE SOIL.

By A. D. Ayers and R. B. Campbell; Soil Sci., Vol. 72, No. 3, pp. 201-206. September 1951.

Freezing-point measurements were made on Pachappa fine sandy loam at five levels of added NaCl and six levels of moisture.

Curves showing total soil-moisture stress plotted against soil-moisture percentage are similar for Pachappa fine sandy loam whether obtained from freezing-point measurements or derived by adding soil-moisture tension to osmotic-pressure values of the soil solution calculated from salt-concentration measurements. With the addition of increasing amounts of soluble salts to a soil, a total soil-moisture stress of 15 atmospheres will occur at increasing soil-moisture percentages.

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EFFECT OF SALINITY ON MOISTURE CONTENT AND FREEZING-POINT DEPRESSION OF SOIL AT PERMANENT

WILTING OF PLANTS.

By D. W. Henderson; Soil Sci., Vol. 72, No. 3, pp. 207-217. September 1951.

The findings reported in this paper are concerned only with permanent wilting and can not be interpreted in terms of plant growth. In general, the plants in high-salt soils passed slowly through stages of temporary wilting.

CHEMICAL WEED CONTROL IN FIELD CROPS.

By L. E. Hogue, R. C. Rothgeb, and Stanley P. Stabler; Md. Agr. Ext. Ser. Fact Sheet No. 13. April 1951.

The weed killer 2,4-D has received more attention than any other. Its high degree of selectivity, its performance at low rates of application, and its low cost have encouraged much research. As a result enough information is at hand to permit recommendations for its use in many situations.

ESTIMATION OF EXCHANGEABLE CATIONS IN SOILS WITH THE BECKMAN FLAME SPECTROPHOTO METER.

By M. Fields, P. J. T. King, J. P. Richardson, and L. D. Swindle; Soil Sci., Vol. 72, No. 3, pp. 219-232. September 1951.

This paper describes a procedure using the Beckman flame spectrophotometer for the rapid routine determination of the four exchange cations, calcium, magnesium, sodium, and potassium.

A METHOD FOR CALCULATING THE SOLUTION PERCENTAGE FROM THE WEIGHT OF A KNOWN VOLUME OF SATURATED SOIL PASTE.

By L. V. Wilcox; Soil Sci., Vol. 72, No. 3, pp. 233-237. September 1951.

The relationship between the saturation percentage and the weight of a known volume of saturated soil paste was worked out and expressed as a simple algebraic equation.

THEORY OF PROBABILITY AND SIZE DISTRIBUTION OF SOIL AGGREGATES.

By Paul W. Evans; Soil Sci., Vol. 72, No. 3, pp. 245-247. September 1951.

This paper discusses experimental data representing substances that are homogeneous. Such substances involve a single maximum ordinate.

Certain minerals were broken down into fine particles that could be represented by distribution curves of this type.

AN APPROACH TO WATERSHED PROTECTION CRITERIA.

By Paul E. Packer; Jour. of Forestry, Vol. 49, No. 9, pp. 639-644. September 1951.

Plots on ungrazed wheatgrass and cheatgrass range having coarse granitic soil were subjected to 1.8 inches of contrast rate rainfall by means of an infiltrometer. Values of nine site characteristics were related to amounts of runoff and eroded soil. Total ground cover and maximum size of bare soil openings were found to be the two characteristics most highly related to overland flow and erosion on both range types. Overland flow and erosion decreased with increase in ground-cover density and with decrease in the size of bare openings. These relations were curvilinear. Ground-cover density was the most influential site characteristic affecting overland flow. The size of maximum bare openings was the most influential characteristic affecting soil erosion.

It was concluded that the goal of management for the best sites on wheatgrass range should be ground cover densities of 70 percent or more in combination with maximum bare openings of 4 inches or less. Corresponding figures for cheatgrass range should be 70 and 2.

SOIL PERMEABILITY AS A FACTOR IN THE TRANSLOCATION OF SALTS ON IRRIGATED LAND.

By H. D. Ayers; Sci. Agr., Vol. 31, No. 9, pp. 333-395. September 1951.

By an analysis of ground-water theory, it was found that high water-table profiles may be the result of excessive canal or irrigation influent seepage, decreasing soil permeability in direction of flow, or alluvial cone topographical formation or a combination of these. The locus of salt concentration occurred in every case where there was a decrease in soil permeability in the direction of ground-water flow.

A PRELIMINARY INVESTIGATION OF ORCHARD GRASS SEED PRODUCTION AS INFLUENCED BY NITROGEN APPLIED AS A SPRAY.

By R. M. MacVicar and D. R. Gibson; Sci. Agr., Vol. 31, No. 9, pp. 396-398. September 1951.

A preliminary investigation was carried out to determine the effect on orchard grass-seed production of nitrogen applied in the solid form

as compared with nitrogen sprayed on the foliage. Nitrogen, in the form of urea, when sprayed on orchard-grass foliage at the rate of 80 pounds of nitrogen per acre, gave significant increases in seed yield. The nitrogen sprayed on, gave seed yields comparable to those obtained when an equal amount of nitrogen was applied in the solid form.

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EFFECT OF SOURCES OF NITROGEN, RATES OF APPLICATION AND METHOD OF APPLICATION ON SEED PRODUCTION OF ORCHARD GRASS.

By R. M. MacVicar and D. R. Gibson; Sci. Agr., Vol. 31, No. 9, pp. 399-412. September 1951.

Substantial increases in orchard grass-seed yield were brought about by nitrogen applications of 80 pounds or more per acre. Optimum results were obtained from the 80-pound rate. No significant differential responses were obtained from the various types of nitrogen fertilizers used.

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THE INTENSIVE PRODUCTION OF HERBAGE FOR CROP-DRYING. III. THE EFFECT OF THE CONTINUED APPLICATION OF NITROGENOUS FERTILIZERS TO GRASSLAND.

By W. Holmes; The Jour. Agr. Sci., Vol. 14, Parts 1 and 2, pp. 64-69. January and April 1951.

The results obtained in the 3-year period covered by this experiment show that applications of nitrogen can considerably increase the yield both of dry matter and of crude protein from grassland and are of value in modifying the seasonality of production. Where massive dressings of nitrogen are applied to grassland and the herbage is cut and removed, fairly heavy applications of potash are essential if production is to be maintained.

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THE INTENSIVE PRODUCTIONS OF HERBAGE FOR CROP-DRYING: IV. THE EFFECT OF MASSIVE APPLICATIONS OF NITROGEN WITH AND WITHOUT PHOSPHATE AND POTASH ON THE YIELD OF GRASSLAND HERBAGE.

By W. Holmes; The Jour. Agr. Sci., Vol. 41, Parts 1 and 2, pp. 70-79. January and April 1951.

A small-scale plot experiment was carried out from 1947 through 1949 to study the effect of massive dressings of nitrogen with and without phosphate and potash on the yield of a ryegrass-dominant sward. The nitrogen treatments were: (1) no nitrogenous fertilizer, (2) 260 pounds, (3) 520 pounds, and (4) 416 pounds of nitrogen annually. These applications were divided into four or five equal dressings, the first being

applied in March and the other after successive cuttings.

In 1948 and 1949 the following mineral treatments were also applied; (1) no mineral fertilizer, (2) 180 pounds K_2O per acre, (3) 120 pounds of P_2O_5 per acre, and (4) treatments 2 and 3 combined. These treatments were applied in two parts, half in the spring and half in mid-summer.

Phosphate did not affect the yields of forage but yields were severely restricted by the absence of potash. Where potash was applied there was no significant change in the annual yield of herbage from 1947 to 1949 for any of the treatments. The nitrogen treatments increased the yields from 4300 pounds dry matter and 600 pounds crude proteins per acre with treatment 1 to 9000 pounds of dry matter and 1900 pounds of crude protein with treatment 3.

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BUFFELGRASS.

By Gordon P. Tompkins; Sheep and Goat Raiser, Vol. 32, No. 1, pp. 34-45. October 1951.

Buffelgrass is a perennial which produces a heavy crown and a dense mass of long, tough roots. It starts producing seed about 60 days after plants shoot out of the ground. It seeds heavily until frost. It can stand a lot of drouth and apparently is adapted to a wide range of soils.

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CONTROL OF EXTENSIVE INFESTATION OF BINDWEED IN NORTHWEST TEXAS.

By R. D. Hamilton, C. J. Whitfield, and H. E. Rea; Texas Agr. Expt. Sta. Prog. Rpt. 1392. August 13, 1951.

Frequent cultivation supplemented by fall application of 2,4-D in a wheat-fallow rotation is suggested for fairly rapid and economical control of large-scale bindweed infestations. Effective but slower reduction in stand of this weed may be expected from the timely use of 2,4-D and intensive cultivation between annual crops of wheat or sorghum, or in a wheat-sorghum-fallow rotation.

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WARM SEASON GRASSES IN THE LOWER RIO GRANDE VALLEY.

By E. M. Trew; Tex. Agr. Expt. Sta. Prog. Rpt. 1393. August 13, 1951.

The results of one year's study indicate that yields up to 14 tons of air-dry hay per acre may

be produced by adapted, desirable warm season perennial grasses with irrigation under Lower Rio Grande Valley conditions.

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COTTON YIELDS IN THE EL PASO VALLEY AS INFLUENCED BY APPLICATIONS OF AMMONIUM NITRATE AND SUPERPHOSPHATE.

By P. D. Christensen and P. J. Lyerly; Tex. Agr. Expt. Sta. Prog. Rpt. 1395. August 21, 1951.

Four fertilizer tests, using three rates (0, 60, and 120 pounds per acre) each of N and P_2O_5 in all possible combinations were conducted during 1950 on farms in the El Paso area.

On three of the four farms, yield differences between treatments were too small to be considered significant.

In the fourth test, nitrogen fertilizer apparently reduced the yield of the cotton, probably due to the influence of nitrogen on the severity of Verticillium wilt infection. Further study will be necessary before any definite conclusions can be drawn regarding the effect of nitrogen on wilt.

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CORN FERTILITY AND SPACING STUDIES AT THE BLACKLAND STATION, 1948-50.

By J. W. Collier, J. C. Smith, and J. R. Johnston; Tex. Agr. Expt. Sta. Prog. Rpt. 1388. July 30, 1951.

Results of a factorial experiment with different fertilizer rates and combinations used with four spacings of corn grown on Austin clay at Temple for the 3-year period, 1948-50, may be summarized as follows:

The 18- and 24 inch spacings were better than either the 12- or 30-inch spacings for the 3-year period. With low fertility, the 24-inch spacing gave slightly higher yields, but with either high fertility or a favorable year, or both, the 18-inch spacing gave the highest yields.

Practically no fertilizer responses were obtained with the spacings wider than 24 inches, regardless of the moisture conditions.

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SEASONAL PERIODS FOR PLANTING GRASSES IN THE SUBALPINE ZONE OF CENTRAL UTAH.

By A. Perry Plummer and John M. Fenley; USDA, Forest Service, Research Paper No. 18. February 1950.

To get successful plantings on high elevation

range lands it is important to know the proper seasonal period in which to plant. This paper presents such information from a 5-year intensive study of planting periods in a typical subalpine area in central Utah. Because of the general similarity of climate in many high mountain areas in the temperate zone, the information should have rather wide application.

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CHANGES IN PONDEROSA PINE BUNCHGRASS RANGES IN NORTHERN ARIZONA RESULTING FROM PINE REGENERATION AND GRAZING.

By Joseph F. Arnold; Jour. of Forestry, Vol. 48, No. 2, pp. 118-126. February 1950.

This paper presents experimental evidence demonstrating that on pine-bunchgrass range (1) grass density declines as pine seedlings become established and develop into saplings; (2) the greater the amount of the 1919 pine canopy, the less the total herbaceous cover; and (3) under protection from grazing tall bunchgrasses dominate the herbaceous cover under all amounts of tree canopy, but under the heavy grazing practiced they have largely been replaced by plants more resistant to grazing, except under the heavier tree canopies. From these findings, information on judging range condition is presented and other practices for range improvement suggested.

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PRECIPITATION IN RELATION TO ALTITUDE IN CENTRAL UTAH.

By Howard W. Lull and Lincoln Ellison; Ecology, Vol. 31, No. 3, pp. 479-484. July 1950.

Precipitation records at four stations, ranging in elevation from 5,543 to 9,860 feet in Ephraim Canyon, on the west front of the Wasatch Plateau, are the basis for this paper. They cover the period 1934 to 1948 inclusive.

Precipitation increases with elevation. The relation between precipitation and elevation is linear, as given by the equation (precipitation in inches, elevation in feet)

$$P = 0.00494 E - 16.95$$

A zone of maximum precipitation, formerly believed to occur at intermediate elevations in Ephraim Canyon, is shown to be nonexistent, and is ascribable to concentration of precipitation at headquarters (8,850 feet) by a high cliff, together with loss of catch at Alpine (10,100 feet) because of windiness.

The yearly pattern of precipitation is that of a sine curve, with a broad crest in late winter (February to April), and broad trough in late summer (July to September). The influence of elevation on precipitation is most marked in

winter, least marked in summer. This difference is associated with a difference of storm types, which are predominantly general in winter and local and erratic in occurrence in summer.

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THE BRUSHLAND PLOW.

By Thomas Coldwell and Joseph F. Pechanec; Ore. Forest and Range Expt. Sta. Research Notes, No. 65. May 5, 1950.

A new implement, the "Brushland Plow," has been developed primarily for killing sagebrush or other undesirable shrubby plants on the rough, brushy range lands of the West. This plow incorporates strength, flexibility, and clearance with a minimum of friction.

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GRASSLAND MANAGEMENT - RANGE.

By W. R. Chapline, Fred G. Renner, James B. Davis, W.M. Myers, R. T. Clark, N. R. Ellis, and W. J. Anderson; Fourth Inter-American Conference on Agriculture Montevideo, U. S. Paper No. 12. December 1950.

This paper discusses range management with the view of obtaining maximum results.

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CONVERTING STANDARD SEEDING RATES FOR GRASSES TO ACTUAL SEEDING RATES PER ACRE.

By Joseph F. Pechanec; Ore. Forest and Range Expt. Sta. Research Notes No. 67. July 10, 1950.

To determine how much seed to sow per acre, first multiply the percentage of germination by the percentage of purity and divide by 100. The answer is the percentage of live pure seed per pound. Next divide 100 by the percentage of live pure seed; this gives a converting factor expressing the pounds of purchased seed which contain one pound of live pure seed. Then to compute actual seeding rates, multiply the live pure seeding rate by the conversion factor.

An alinement chart for use with seed having more than 30 percent live pure seed will give the conversion factor without computation of the percentage of live pure seed. The chart will be useful for all but a few species of grass.

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A TIN CAN INFILTROMETER WITH IMPROVISED BAFFLE.

By A. B. Evanko; Mont. Forest and Range Expt. Sta. Research Note No. 76. February 1950.

This paper describes an infiltrometer made from

a tin can.

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EFFECTS OF CONTROLLED BURNING ON BITTERBRUSH ON THE UPPER SNAKE RIVER PLAINS.

By James P. Blaisdell; USDA Forest Service, Research Paper No. 20. April 1950.

The widespread use of fire in recent years for eradication of big sagebrush has aroused considerable interest in the reaction of associated shrub species to burning. The effect of fire on bitterbrush, a desirable shrub for both domestic livestock and big game, has been the object of particular concern. A complete report of the long time effects of an experimental burn on vegetation is now being prepared, but in order to provide immediate information on response of bitterbrush, this brief paper is presented.

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HINTS ON ERADICATION OF BIG SAGEBRUSH (ARTEMISIA TRIDENTATA) BY CHEMICAL SPRAYING AND BY BURNING.

By A. C. Hull, Jr.; Colo. Forest and Range Expt. Sta. Mimeo. October 25, 1950.

Every year thousands of acres of sagebrush land are treated mechanically, burned, or sprayed with chemicals to control sagebrush. These hints are not to weigh the merits of different methods of eradication, but merely to help those who plan chemical spraying or burning of sagebrush.

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HEALTHY PLANTS MUST BE WELL NOURISHED.

By C. M. Woodruff; Better Crops with Plant Food, Vol. 35, No. 8, pp. 6-11. October 1951.

Plant diseases are commonly associated with some microbe or insect that attacks the plant. In the "fight" on these enemies, the diseased or infected plants are often sprayed or dusted with a compound which is lethal to the organism but can be tolerated by the plant. A currently hopeful approach to the control of plant diseases is looking to the breeding of disease-resistant varieties. Little by little, evidence and experience are accumulating to suggest that some of the plant diseases may be the sequel to the deficient mineral nutrition of the plant.

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PRODUCING SMALL GRAIN MORE EFFICIENTLY.

By W. H. Rankin; Better Crops with Plant Food, Vol. 35, No. 8, pp. 12-13. October 1951.

Research and development precede quantity

production of the most wanted and profitable products. When a superior article reaches the market, the less desirable and usually older competitive ones are superseded by its better qualities and characteristics. Likewise, small grain research is developing strains of wheat, oats, and barley, with more disease resistance, more tolerance to freezing temperatures, and stiffer straw that resists lodging, which are taking the place of older strains. All of these characteristics contribute to higher yields and more efficient production.

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ROTATION FERTILIZATION.

By James H. Eakin, Jr.; Better Crops with Plant Food, Vol. 35, No. 8, pp. 17-20 and 48. October 1951.

The "Big Three" of soil productivity maintenance are lime, fertilizer, and organic matter. Haphazard systems of soil management may provide adequately for one or even two of these essential factors; but to neglect the third may seriously limit crop production. The value of lime and fertilizer will be greatly enhanced if provisions are made for the replenishment of organic matter. Research has shown that crop yields may be limited as often by poor soil physical condition as they are by lack of essential plant nutrients.

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SOIL-FERTILITY LOSSES BY EROSION.

By J. H. Stallings; Better Crops with Plant Food, Vol. 35, No. 8, pp. 21-26 and 45-47. October 1951.

The importance of fertility erosion - caused by the action of wind and water sorting, sifting, and removing the lightweight fertility-bearing portion of the soil while leaving sand and other heavy material - is not fully appreciated. The loss of this fertile material may be the most serious immediate effect of soil erosion. The amount of topsoil may be reduced materially by the removal of sand, gravel, and other inert material over a period of years, but the removal of organic matter and plant nutrients decreases soil fertility most rapidly.

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THE MISSOURI FARM WATER-MANAGEMENT PLAN.

By Robert P. Beasley; Agr. Eng., Vol. 32, No. 10, pp. 541-543. October 1951.

If terraces or other water-management structures are needed, they should be considered first in planning because they usually influence the shape and arrangement of fields and the general

drainage pattern of the farm.

A complete water-management system should be planned for the entire farm before construction is begun on terraces, terrace outlets, diversion channels, ponds, or any other permanent structure on any part of the farm.

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LADINO CLOVER SEED PRODUCTION IN CALIFORNIA.

By Victor P. Osterli and Milton D. Miller; What's New in Crops and Soils, Vol. 4, No. 1, pp. 18-20. October 1951.

Two hundred and fifty pounds of clean seed were produced per acre in first-year stand of Ladino clover last year. The clover was seeded in the fall and irrigated every 10 days from the middle of May until early August.

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CONTROL OF GROWING STOCK IN EVEN-AGED STANDS OF CONIFERS.

By F. G. Wilson; Jour. Forestry, Vol. 59, No. 10, pp. 692-695. October 1951.

This discussion is limited to pure, even-aged stands of conifers. During a 5-year interval between thinnings, a thinned plot produced 5.5 percent more total cubic volume than the check plot. In other words, maximum increment is secured at optimum rather than at maximum levels of growing stock.

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CHEMICAL CONTROL OF INFERIOR SPECIES IN THE MANAGEMENT OF LOBLOLLY PINE.

By L. E. Chaiken; Jour. Forestry, Vol. 59, No. 10, pp. 695-697. October 1951.

This paper discusses the use of chemicals in controlling undesirable species in loblolly pine forests.

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FROM FIELD TO FOREST - A 50-YEAR RECORD.

By Daniel Denuyl; Jour. Forestry, Vol. 49, No. 10, pp. 698-704. October 1951.

Woodland-area experiments show that protection from fire and livestock grazing are essential needs. Improvement cuttings designed to increase the quality and the quantity of desirable species are needed to build up the growing stock and to increase the volume increment.

Old fields are not suitable sites for planting or direct seeding of hardwoods. Old field soils

do not have the organic content, the water-holding capacity, or the porosity necessary to grow hardwoods.

TREE AND SHRUB INVESTIGATIONS IN THE SOUTHERN GREAT PLAINS.

By E. W. Johnson; Jour. Forestry, Vol. 49, No. 10, pp. 716-719. October 1951.

This paper presents results of research studies conducted at Woodward, Okla., and other experiment stations in the Southern Plains.

SITE INDEX OF OAKS IN RELATION TO SOIL AND TOPOGRAPHY IN NORTHEASTERN IOWA.

By Dean Einspahr and A. L. McComb; Jour. Forestry, Vol. 49, No. 10, pp. 719-723. October 1951.

Site index of oaks was studied in relation to soil series, soil profile characteristics, and topography on 108 site-index plots and 16 volume plots in the Fayette-Dubuque-Story soil association area of northeastern Iowa. Soil topographic features which affect the availability of moisture for growth appeared to be correlated with site index. The results are discussed.

GRASSLAND FARMING.

By W. M. Myers; Agr. Inst. Review, Vol. 6, No. 5, pp. 11-14 and 33. Ottawa, Canada, September 1951.

Agriculture in the United States is undergoing a change, perhaps the greatest change it has undergone in more than two centuries of its existence. We have been cash-and-row crop farmers, concerned primarily with the production of corn, cereal grains, cotton, tobacco, and other cash and row crops. We are now converting our agriculture to a grassland type of farming. The change is occurring gradually, perhaps too slowly, throughout the entire United States.

THE PLACE OF FARM MACHINERY IN SOIL CONSERVATION.

By G. E. Ryerson; Agr. Inst. Review, Vol. 6, No. 5, pp. 35-40. Ottawa, Canada. September 1951.

This article discusses the place of farm machinery in a soil conservation program.

SOME PLANT RESPONSES TO CERTAIN INSECTICIDES IN

THE SOIL.

By Arthur C. Foster; USDA Cir. 862. March 1951.

Extensive greenhouse and field experiments on the effects of DDT, BHC, and certain other insecticides upon plant growth when mixed with the soil have been under way since the summer of 1945. This circular summarizes the results obtained primarily in studies with DDT but includes some data on BHC, Chlordane, toxaphene, and parathion.

THERMODYNAMICS OF SOIL MOISTURE.

By Willard Hale Gardner, Walter Hale Gardner, and Willard Gardner; Soil Sci., Vol. 72, No. 2, pp. 101-105. August 1951.

This article points out what seems to be serious difficulties regarding certain basic equations in classical literature of thermodynamics.

POTASSIUM REMOVAL FROM IOWA SOILS BY GREENHOUSE AND LABORATORY PROCEDURES.

By P. F. Pratt; Soil Sci., Vol. 72, No. 2, pp. 107-117. August 1951.

The amounts of K extracted from thirteen Iowa soils by laboratory methods were highly correlated with K removal from these soils by cropping with alfalfa in the greenhouse. The release of K from nonexchangeable forms by extraction for 10 minutes with boiling N HNO_3 or by extraction with Dowex-50 cation exchange resin was highly correlated with release of K from nonexchangeable forms to alfalfa.

FORMS AND DISTRIBUTION OF PHOSPHORUS IN THE HORIZONS OF SOME NEBRASKA SOILS IN RELATION TO PROFILE DEVELOPMENT.

By W. H. Allaway and H. F. Rhoades; Soil Sci., Vol. 72, No. 2, pp. 119-128. August 1951.

The purpose of this study was to determine the changes in the nature and distribution of the phosphorus in soils developing from calcareous loess during the process of soil development.

CATION-EXCHANGE CAPACITY OF PLANT ROOTS.

By Mack Drake, Jonas Vengris, and William G. Colby; Soil Sci., Vol. 72, No. 2, pp. 139-147. August 1951.

This study of the cation-exchange capacity was

made to determine the order and magnitude of cation-exchange capacity of roots of a large number of agricultural plants.

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EFFECTS OF ORGANIC MULCHES ON SOIL CONDITIONS AND SOYBEAN YIELDS.

By A. B. S. Verma and Helmut Kohnke; Soil Sci., Vol. 72, No. 2, pp. 149-156. August 1951.

This study was conducted to determine what effect organic and inorganic mulches have on soybean yields. Physical and chemical soil conditions were determined to find the direct cause of any variation in yields.

Mulching resulted in an average of 3.3 percent more available soil moisture compared to the unmulched soils. The nitrate content of the untreated plots and those mulched with glass wool was higher than that of plots mulched with organic matter.

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IMPORTANCE OF SODIUM FOR PLANT NUTRITION: V. RESPONSE OF CROPS OTHER THAN BEET.

By J. J. Lehr; Soil Sci., Vol. 72, No. 2, pp. 157-166. August 1951.

The immediate and residual effects of sodium on different agricultural crops in a 7-year sequence on a humic sandy soil were investigated by comparing Chilean nitrate of soda with calcium nitrate at different potassium levels.

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SELECTED LIST OF PUBLICATIONS ON HYDROLOGY AND HYDRAULICS.

USDA, SCS, Washington 25, D. C. July 1951.

This is a list of publications published by the Soil Conservation Service Research personnel pertaining to hydrology and hydraulics. The publications are arranged alphabetically under the following subjects: Runoff, Design - Hydraulic and Hydrologic, Hydrologic Data, Hydrology (Watersheds), Hydraulic Measuring Devices, Model Tests, Snow Surveys, Probability Curves, Streambank Erosion and Miscellaneous.

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THE PROTEIN, PHOSPHORIC ACID AND LIME CONTENT OF SMALL GRAINS, HARDINGGRASS, ALFALFA AND SWEETCLOVER GROWN IN THE LOWER RIO GRANDE VALLEY.

By E. M. Trew and L. C. Kapp; Tex. Agr. Expt. Sta. Prog. Rpt. 1398. September 6, 1951.

Camellia and Flutex oats, Coliad barley, Sea-

breeze wheat and Hardinggrass had lime contents ranging from 0.56 to 1.11 percent which is well above the minimum of 0.43 percent for "good". Irrigation and season had no apparent effect on the lime content of these grasses. Six varieties of alfalfa and six of sweetclover contained a high level of lime, above 0.83 percent. A slight decrease in lime percentage from early to late spring was noted. Sweetclover grown without irrigation contained more lime than when grown under irrigation.

The phosphoric acid content of the grasses was well above the deficiency level of 0.32. Alfalfas contained more than 0.49 percent, while the sweetclovers contained 0.56 percent or more. Irrigation appeared to increase the phosphorus content of the grasses and sweetclovers. In late spring, the phosphoric acid content decreased in the grasses, increased in the alfalfa and remained the same in the sweetclover.

The protein content was at a high level, above 15.0 percent, in 89 percent of the grass samples, and in all the alfalfa and sweetclover samples. Irrigation tended to decrease the protein content of the grasses, but had no apparent effect on the protein in the sweetclovers. In late spring, the protein content of the grasses and sweetclovers was lower than in winter or early spring, but season did not appear to affect the alfalfas in this respect. Camellia and Fultex oats under irrigation produced more than 1,000 pounds of protein per acre. In 7 months, Indian alfalfa produced 1,455 pounds of protein per acre. Hubam sweetclover under irrigation produced 1,304 pounds of protein per acre.

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RECOMMENDATIONS FOR RANGE SEEDING IN UTAH.

By L. A. Stoddart, Wayne Cook, Harold J. Burbank, Joseph Libbie, George Stewart, and R. L. Wrigley. Utah Agr. Ext. Ser., Extension Bul. 193. Feb. 1950.

When properly done, artificial seeding has been highly successful on suitable land where precipitation is 12 inches or more. It has been moderately successful on good soils receiving as low as 9 or 10 inches, but here greater care in planting is required.

Abandoned farm lands and valley and foothill range lands bearing a heavy cover of sagebrush afford the best opportunities for successful seeding. Cheatgrass areas can also be successfully reseeded if the cheatgrass is first removed. Deep mountain soils with gentle slopes are also promising areas. Sandy, salty, or rocky soils and steep slopes offer difficulties for which the farmer should seek technical advice before he undertakes seeding.

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PRELIMINARY GUIDE TO RESEEDING PINYON-JUNIPER
LANDS OF WESTERN COLORADO.

By A. C. Hull, Jr., and Clyde W. Doran; Colo.
Forest and Range Expt.Sta. Paper No. 4,
December 1950.

This publication gives some preliminary guides
to help livestock men and range administrators
do a better job of seeding depleted pinyon-
juniper range land.

RESEEDING SAGEBRUSH LANDS OF WESTERN COLORADO.

By A. C. Hull, Jr., Clyde W. Doran, C. H. Wasser,
and D. F. Hervey; Colo. Agr. Expt.Sta. Bul.
413-A. December 1950.

This publication is to help livestock men and
range administrators do a better job of seeding
depleted sagebrush rangeland.

INDICATORS OF CONDITION AND TREND ON HIGH RANGE-
WATERSHEDS OF THE INTERMOUNTAIN REGION.

By Lincoln Ellison, A. R. Croft and Reed W.
Bailey; USDA Forest Service Agr. Handbook No.
19, August 1951.

This publication is intended to help the range
manager judge condition and trend accurately in
the course of range inspection. In order to
make best use of the evidence on the ground, he
has three major needs: First, a technical founda-
tion of ecological principles underlying the
concepts of condition and trend; second, an un-
derstanding of condition and trend as they re-
late to the normal and to objectives in manage-
ment; and third, a knowledge of indicators of
condition and trend, their meanings and their
limitations. The three major divisions of this
publication are intended to serve these needs,
in the order given.

THE DALLES POCKET GOPHER AND ITS INFLUENCE ON
FORAGE PRODUCTION OF OREGON MOUNTAIN MEADOWS.

By A. W. Moore and Elbert H. Reid; USDA Cir. No.
884. August 1951.

Pocket gophers are scattered throughout western
range lands, and are abundant in many places.
They are especially common on the mountain mea-
dows of the West, where range values vary from
0.1 or less animal-unit month per acre to 2 or
more animal-unit months. To determine the value
of pocket gopher control as a range-improvement
practice a 17-year study was conducted of the
Dalles pocket gopher, its life history, and in-
fluence on plant composition and grazing values

on mountain meadows.

SERICEA IN CONSERVATION FARMING.

By R. Y. Bailey; USDA Farmers' Bul. No. 2033.
September 1951.

Sericea is contributing to a new and better
Southern agriculture. Bare slopes that have in-
spired poetic reference to the red hills of
Georgia and other Southern States are putting on
a coat of green. Erosion losses are being re-
duced, tired lands are being revitalized, and
cash-crop farming is trending toward a better
balance between crops and livestock.

Sericea is a hardy, deep-rooted, perennial sum-
mer legume that grows on sites which are not best
for many of the other legumes and grasses. Its
roots penetrate deeply enough to reach moisture
during periods of summer drought and take mineral
nutrients that are beyond the reach of shallow-
rooted plants.

In addition to its soil-holding and soil-improv-
ing abilities, sericea is a good forage crop,
valuable for both hay and pasture. Its herbage
feeds livestock and thus gives farmers a market
outlet for other legumes and grasses that are
needed in protective and conservation-type rota-
tions on cultivated land.

CAROTENE, PROTEIN, AND PHOSPHORUS IN RANGE AND
TAME GRASSES OF WESTERN NORTH DAKOTA.

By Warren C. Whitman, D. W. Bolin, Earle W.
Klosterman, H. J. Klostermann, Kenneth D. Ford,
Leroy Moomaw, D. G. Hoag, and M. L. Buchanan;
N. D. Agr. Expt.Sta. Bul. 370. June 1951.

Field moisture, carotene, protein, and phosphorus
were determined in 11 native range grasses, two
tame grasses, and some miscellaneous forage dur-
ing the 1946 and 1947 growing seasons. The
native grass pasture at the livestock unit, from
which samples of native grasses for analysis were
taken, is a typical piece of mixed prairie with
needle-and-thread, western wheatgrass, blue gama
grass, threadleaf sedge, plains reedgrass,
prairie Junegrass, and prairie sandgrass as the
principal species. A small area along a water-
course in the pasture supports a tall grass type
containing such species as big bluestem, little
bluestem, and Kentucky bluegrass.

The grasses were high in moisture, carotene, pro-
tein, and phosphorus in the spring and early sum-
mer when they were in a young, actively growing
condition, and relatively low in these constitu-
ents when they were mature and dry in late summer
and fall.

The native and tame grasses lost on the average

about 87 percent of their carotene, 71 percent of their protein, and about 66 percent of their phosphorus by the end of September.

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SETTLERS' PROGRESS ON TWO NORTH DAKOTA IRRIGATION PROJECTS.

By Stanley W. Voelker; North Dakota Agr. Expt. Sta. Bul. 369. June 1951.

Main purposes of this study were to determine what success settlers on the Lewis & Clark and Buford-Trenton Projects have had in gaining control of the productive resources needed for irrigation farming, the extent to which credit has been used in farm development and resource accumulation, and what problems have confronted the settlers in organizing and developing irrigated farms.

Two groups of settlers were interviewed in June of 1950 to obtain data on operating resources and finances: (1) Those who operated irrigated farms containing little or no dry land, and (2) those who operated partly irrigated farms containing sizable acreages of dry cropland or range. The period of settlement of the first group varied from one to 12 years, with an average of 4.8 years, while that of the second group varied from one to nine years, with an average of 3.5 years.

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MISSISSIPPI STATE GEOLOGICAL SURVEY.

By James Samuel Attaya; Miss. State Geol. Survey, Lafayette County, University, Miss. 1951.

An exhaustive study has revealed that the "Holly Springs" formation is the equivalent of three formations - the Meridian, the Tallahatta, and the Kosciusko: that the white clays of the "Holly Springs" are Tallahatta in age to a large degree and reworked Tallahatta to a lesser degree; that the carbonaceous clay shale once identified as the Grenada formation and assigned to the Wilcox is actually Tallahatta shale and Claiborne in age; that the assigned great thickness of the "Holly Springs" based on outcrop-width and estimated dip, is considerably in error due to the practically horizontal attitude of the three component formations; that the Kosciusko was deposited on the peneplaned Tallahatta and Meridian formations following elevation of the north-Mississippi area at some time after the Zilpha was deposited; that this mantle of Kosciusko sand was once referred to as the Lafayette formation, a correlation finally abandoned because of the confusion resulting from the inability of geologists to recognize the existence of three comitantly sand formations and their unconformable relationship.

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PRELIMINARY REPORT OF TESTS ON A GRASS-LINED CHANNEL WITH A CENTER CONCRETE GUTTER SECTION.

By W. O. Ree; USDA, SCS, Report for In-Service use only. June 1951.

This report presents the results of the first series of tests on a grass-lined channel with a small concrete chute down the center. The test section of this waterway is about 100 feet long with a top width of 24 feet. The bottom slope is 10 percent. The concrete gutter has a rounded cross section with a top width a little less than 4 feet. Designs of the channel and the gutter are shown. The grass portion of the test channel is lined with Bermuda grass.

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A COMMUNITY APPROACH TO SOIL CONSERVATION.

By C. L. Folse, W. H. Heneberry, J. E. Willis, and E. L. Sauer; Ill. Agr. Expt. Sta. Preliminary Report, Mimeo. March 1951.

The general objective of this study was to provide factual information about farming operations, soil conservation needs and practices, characteristics of farm operators, their identification with and participation in community groups, and other pertinent material from a random sample of farm households in the Odell and Rankin communities in Illinois. Surveys were made during January-March 1950 of 100 farms in the Odell community and 98 farms in the Rankin Community. The questions were designed primarily to aid in establishing "bench marks" or points of reference from which future progress in soil conservation and improvement could be assessed and measured in an over-all community approach to the problem.

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CORN FERTILITY STUDIES AT THE BLACKLAND STATION, 1949-51.

By J. W. Collier; Tex. Agr. Expt. Sta. Prog. Rpt. 1418. November 28, 1951.

Supplemental irrigation increased corn yields about 9 bushels per acre. This is equivalent to an increase of 3 bushels per acre for each acre-inch of water applied in June.

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REPORT OF THE NATIONAL SOIL STRUCTURE - ORGANIC MATTER WORK GROUP TO THE NATIONAL SOIL AND FERTILIZER RESEARCH COMMITTEE.

By C. S. Slater, F. E. Broadbent, W. P. Martin, J. B. Page, S. A. Taylor, and R. W. Pearson; Mimeo. Rpt. of National Soil and Fertilizer Research Committee. December 1951.

This committee considered the national aspects of the soil research.

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SOME PHYSICAL AND MECHANICAL PROPERTIES OF AMERICAN BEECH.

By Benson H. Paul and John T. Drow; USDA Forest Service, Beech Utilization Series No. 1, Oct. 1951.

This publication contains the available information about utilization of American beech.

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SUMMER FALLOWING TO MEET WEATHER RISKS IN WHEAT FARMING.

By E. Lloyd Barber; USDA Agr. Economics Research, Vol. 3, No. 4, pp. 118-123. October 1951.

This paper gives some of the results of a study arrived at measuring the extent of the protection approved by, and the cost of, summer fallow in terms of reducing the frequency with which gross returns per acre fail to cover the direct crop costs.

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UTILIZING OUR SOIL RESOURCES FOR GREATER PRODUCTION.

By Robert M. Salter; The Annals of the American Academy of Political and Social Science, pp. 179-190. November 1951.

The author discusses the necessary steps needed in the management of our soils in order to make possible sufficient production to support the United States in its position of world leadership.

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RANGE PRACTICES THAT CAUSE ANIMALS TO GRAZE ALL PARTS OF THE RANGE EQUALLY.

By B. W. Allred; Sheep & Goat Raiser, Vol. 32, No. 3, pp. 10-12. December 1951.

The author discusses range management practices which cause livestock to graze all parts of the range equally.

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HYDRAULIC MODEL STUDIES FOR WHITING FIELD NAVAL AIR STATION MILTON, FLORIDA PART V - STUDIES OF OPEN-CHANNEL JUNCTIONS.

By Charles E. Bowers; Minn. Agr. Expt. Sta. Proj. Rpt. No. 24. January 1950.

This study was undertaken for the specific purpose of obtaining information that would assist in the design of open-channel junctions in the drainage system at Whiting Field.

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CAPACITY OF BOX INLET DROP SPILLWAYS UNDER FREE AND SUBMERGED FLOW CONDITIONS.

By Fred W. Blaisdell and Charles A. Donnelly; Minn. Agr. Expt. Sta. Tech. Paper No. 7, Series B. January 1951.

This paper presents the results of studies conducted to determine the capacity of box inlet drop spillways under free and submerged conditions.

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RELATION OF SEDIMENTATION TO ACCELERATED EROSION IN THE MISSOURI RIVER BASIN.

By Louis M. Glymph, Jr.; USDA SCS-TP-102. July 1951.

This publication presents the results of studies conducted to determine the relationship between sedimentation and accelerated erosion in the Missouri River Basin.

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MANAGEMENT OF IRRIGATION AND DRAINAGE ENTERPRISES IN UTAH.

By J. Howard Maughan and O. W. Israelsen; Utah Agr. Expt. Sta. Bul. 349. June 1951.

The purposes of this study on the management of irrigation and drainage enterprises in Northern Cache Valley, Utah, are to assist farmers in the area and in other similar areas to learn the causes of their irrigation and drainage problems and to determine the best approach toward their solution. The bulletin first presents some of the general problems connected with irrigation and drainage organizations, and then discusses the problems of the local area, known as the Cub River area.

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RESEARCH SETS PATTERNS FOR THE CENTRAL BLACKLANDS.

By J. R. Johnston; Texas Agr. Expt. Sta. Mis. Pub. 65. January 1951.

This report seeks to give its readers some ideas on a comprehensive research approach to the major agricultural problems of the Central Blackland area of Texas.

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GROUND WATER AND DRAINAGE INVESTIGATIONS IN SAN FERNANDO VALLEY, LOS ANGELES, CALIFORNIA (PRO-VISIONAL).

By William W. Donnan, G. Marvin Litz and V. S. Aronovici; USDA, SCS, Multi. December 1950.

This report presents the results of research studies of high ground water and drainage problems in San Fernando Valley.

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CHEMICAL CONTROL OF ESTABLISHED JOHNSON GRASS ON NON-CULTIVATED LAND.

By H. E. Rea, F. A. Wolters, and J. E. Roberts; Tex. Agr. Expt. Sta. Prog. Rpt. 1430. January 16, 1952.

Borascu, Concentrated Borascu, Polybor-chlorate, TCA, Ammate and CMU were used to treat thick stands of established Johnson grass in a fence line and along a roadside. Treatment was made to short-clipped grass under conditions approaching that of a well-kept meadow. Established stands were reduced 95 percent or more, and reinfestation for a full season was prevented by a single fall application of 18 pounds of Borascu per 100 square feet, 9 pounds of Concentrated Borascu, and 3 pounds of Polybor-chlorate, respectively.

Initial stands of established Johnson grass were killed by a single application of 50 pounds of TCA or more per acre, whether the application was made the previous fall or in the spring. However, reinfestation of the treated areas by Johnson grass seedlings occurred before the end of the 1951 season for most rates of TCA tried. Reinfestation was delayed longer and was less intense the later TCA was applied. The duration of the effects of 300 pounds of TCA per acre was not materially longer than that of 50 pounds per acre.

Ammate applied in the late spring at the rate of 50 to 300 pounds per acre killed established Johnson grass to the ground, reduced the intensity of regrowth from rootstock, and prevented the current season reinfestation by Johnson grass seedlings. The intensity of regrowth from rootstock was less the higher the rate of Ammate used. Applications of 200 pounds per acre materially reduced regrowth from rootstocks.

Established Johnson grass died and no regrowth or reinfestation occurred during 1951 following late season applications of 12 pounds per acre or more of CMU.

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HARVESTING CLOVER AND DALLISGRASS SEED IN THE TEXAS RICE BELT.

By Ralph M. Weihing, James B. Moncrief, and

Wm. C. Davis; Texas Agr. Expt. Sta. Prog. Rpt. 1423. December 22, 1951.

During each of the past 3 years, from 50 to 135 pounds per acre of white clover seed were harvested on the Rice-Pasture Experiment Station and as much as 75 pounds per acre of Dallisgrass seed were gathered in one combining in 1950. This grass and clover seed is being used to establish other pastures. The results show that good seed can be produced in the Gulf Coast area, that it can be used on local pastures, and that it can be harvested with rice-farm equipment, or with small additions to or slight modifications of it.

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THE EFFECT OF FERTILIZERS ON THE NUTRITIVE QUALITY OF CROPS AND THE HEALTH OF ANIMALS AND MEN.

By Kenneth C. Beeson; Amer. Plant Food Council, Inc., Jour., Vol. 51, No. 4, pp. 6-11. October-December 1951.

This paper describes certain soil abnormalities with respect to mineral elements that result in nutritional troubles in plants and animals; shows that some of these abnormalities can be satisfactorily corrected by adding the appropriate fertilizers and other chemical compounds to the soil; examines available evidence on the effects of these fertilizers and other chemical compounds on the nutritive quality of crops; and interprets this evidence in terms of human health and welfare.

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GRASSLAND FARMING.

By Harley A. Daniel; Acco Press, Vol. 28, No. 2, pp. 1-4. February 1950.

This paper presents experimental results showing the bountiful benefits to land and farm income that follow maximum conservation of land resources.

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TRENDS TOWARD GRASSLAND AGRICULTURE IN THE SOUTHEAST.

By R. Y. Bailey; USDA, SCS, Mimeo. paper presented at the 7th Ann. Town and Country School, Emory Univ., Ga. August 11, 1951.

The author describes the progress being made in grassland farming in the Southeast.

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TEACHING YOUTH TO SAVE THE SOIL.

By Harley A. Daniel; What's New in Crops & Soils,

This paper describes a new type of conservation contest, based on the simple axiom that "experience is the best teacher", which is teaching youth how to save soil and improve the land.

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FERTILIZER HELPS CONSERVE SOIL AND WATER IN OKLAHOMA.

By Harley A. Daniel; Commercial Fertilizer, Vol. 82, No. 2, p. 54. February 1951.

Conservation farming provides for the best and full productive capacity of the land. It is based on our understanding of land capability and nature's methods of developing and managing soil, water, and vegetation. The most effective and practical means of such farming consists of a combination of sound land use, water control, soil improvement, crop selection, and farm management. Where these practices have been properly applied severe erosion has been controlled, runoff materially reduced, and crop production increased.

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SHRUB PLANTINGS FOR SOIL CONSERVATION AND WILDLIFE COVER IN THE NORTHEAST.

By Frank C. Edminster and Richard M. May; USDA, Cir. No. 887. November 1951.

This circular sets forth the results of field tests on over 100 species of shrubs which have been planted under different climatic and soil conditions for conservation purposes in various parts of the Northeast. Instructions are given for the successful planting and care of many of these shrubs.

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MAKING LAND PRODUCE USEFUL WILDLIFE.

By Wallace L. Anderson; USDA Farmers' Bul. No. 2035. 1951.

You can have wildlife on your land and have a better farm or ranch because of it. Every farm is a complex community which is successful only if all the living things in it are working together. What you can do on your own land to maintain the most desirable biologic balance is described in this bulletin.

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VEGETATION OF THE CREOSOTE BUSH AREA OF THE RIO GRANDE VALLEY IN NEW MEXICO.

By J. L. Gardner; Ecological Monographs, Vol. 21, pp. 379-403. October 1951.

The information presented in this paper was collected during the course of investigations on arroyo control along the Rio Grande. It is derived from notes and measurements made in the shrub belt from Las Cruces, New Mexico, as far north as creosote bush is prominent in the vegetation, a distance of approximately 170 miles.

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MECHANICS OF WIND EROSION.

By J. H. Stallings; USDA, SCS-TP-108. November 1951.

This paper describes the mechanics of the wind-erosion process. It describes the three types of soil movement involved in the wind-erosion process - saltation, suspension, and surface creep. It discusses the three main phases in the wind-erosion process, i.e., initiation of the movement of soil particles, their transport, and their deposition.

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FERTILIZER USE AND CROP YIELDS IN THE NORTH CENTRAL REGION.

By W. E. Colwell, J. P. Conrad, K. C. Berger, Mack Drake, D. B. Ibach, and R. Q. Parks; Report No. 2 of the Fertilizer work group to the National Soil and Fertilizer Research Committee, Preliminary draft. July 1951.

This is one of five initial reports of the National Soil and Fertilizer Research Committee, summarizing crop production potentials at different levels of fertilizer supply.

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FOURTEEN-YEAR SUMMARY OF RANGE IMPROVEMENT STUDIES AT THE U. S. SOUTHERN GREAT PLAINS FIELD STATION WOODWARD, OKLAHOMA. 1937-1950.

By E. H. McIlvain and D. A. Savage with Economic Analyses by E. A. Tucker and W. F. Lagrone; Okla. Agr. Expt. Sta. Mimeo. Prog. Rpt. 1951.

Range improvement studies have been conducted at the U. S. Southern Great Plains Field Station, Woodward, Okla., since 1937. Intensive studies on grass establishment, brush control, and related work were made on the 920-acre experiment station and on neighboring ranches throughout the 14-year period. Grazing investigations with beef cattle were begun in 1941 and have been in progress for 9 years on the Southern Plains Experimental Range, a 4300-acre research unit located on sandy land near Fort Supply, Okla.

Objectives of the studies have been to determine, the most productive, practical, and profitable means of (1) reseeding grasses, (2) controlling brush and weeds, (3) managing native range and

reseeded grassland, (4) supplementing range forage with protein, minerals, and other feeds, and (5) controlling external parasites on beef cattle. Results of these investigations have specific application to sandy land and general application to hard land in western Oklahoma, the Texas Panhandle, northeastern New Mexico, southeastern Colorado, and southwestern Kansas. Many of the principles developed from these studies have been applied successfully elsewhere in the West.

RESULTS OF TESTS ON A CHUTE WITH A ST. ANTHONY FALLS STILLING BASIN.

By William O. Ree; USDA, SCS-TP-107. September 1951.

Tests of the St. Anthony Falls Stilling Basin during a 2-year period showed that the stilling basin was very effective and completely satisfactory. Very little scour of the channel bed occurred. It should be noted, however, that the bed material at the point of discharge was a rather firm clay. A sandy material might have shown a little different result.

The estimates of the water-surface profile were satisfactory for determining the chute-wall heights, but not for estimating the velocity and depth of the flow entering the basin. The latter estimates should be made on the basis of all data available, including observed profiles and the available Manning's n valves.

STUDIES ON SOIL STRUCTURE.

By D. S. Hubbell and Glen Staten; New Mex. Agr. Expt.Sta. Tech. Bul. 363. October 1951.

This bulletin reports the results from experiments to determine the causes and functions of soil structure in a heavy phase of the Gila soil series.

PASTURE IMPROVEMENT.

By C. H. Moran; Maine Agr. Expt.Sta. Bul. 488. February 1951.

Bluegrass-white clover pastures can be made to furnish abundant grazing in spring and fall by fertilization, but they make very little growth during midsummer. Ladino clover-grass mixtures also respond exceptionally well to fertilizer and in addition maintain a better growth during the hot-dry period in July and August.

The highest average yields of total digestible nutrients were obtained where the fields received

the equivalent of one half ton of 10-10-10 fertilizer per acre. Ten tons of manure reinforced with superphosphate were equally as effective in obtaining high yields.

SUBSIDENCE OF PEAT SOILS IN THE EVERGLADES REGION OF FLORIDA.

By John C. Stephens and Lamar Johnson; USDA SCS in coop. with Central & Southern Fla. Agr. Exp. Sta. August 1951.

All organic soils lose surface elevation or subside when drained. This loss apparently continues as long as the lands are drained. The Florida Everglades, which contains the largest known body of organic soils in the world, has lost as much as 6 to 7 feet of soil in the Lake Okeechobee area since 1912.

The Everglades originally contained about 2,500,000 acres of organic soils but much of these are now very shallow and the deeper peat which now remains in the Upper Everglades comprises the main body of potential agricultural land in the Everglades area. This soil is particularly valuable for agricultural use. The soil has lost approximately forty percent of its original volume in the last 40 years since drainage operation began.

THE NINETEENTH ANNUAL REPORT OF THE UPPER MISSISSIPPI VALLEY SOIL CONSERVATION EXPERIMENT STATION.

By Orville E. Hays; Wis. Agr. Expt.Sta. Mimeo. Report. March 1951.

Intense storms at LaCrosse in 1950 resulted in erosion that exceeded any one year's total soil loss since 1940. Corn land lost 3 and grain land 4.2 times as much soil during the year 1950 as the average annual loss for the period 1940 to 1949. The average annual loss for this period was 6.8, 13.4, and 0.3 ton per acre, respectively, for corn, oats, and hay in a CGHHH rotation.

MICROORGANISMS AND THEIR EFFECTS ON CROPS AND SOILS.

By T. M. McCalla and T. H. Goodding; Neb. Agr. Expt. Sta. Cir. 90. April 1951.

Many of the cropping and tillage practices that a farmer uses are effective in crop productivity because of their influence on microbial activity. For example, when the soil is tilled, aeration is improved and aeration is favorable for the growth of the nitrogen, sulfur, and iron

oxidizing organisms. When the soil environment lacks oxygen, it is unfavorable as an environment for many plants. Legumes are inoculated, planted, and turned back into the soil to increase available nitrogen for the following crop. Every partice or management system influences microbial activity which in turn influences the decomposition of plant residues, the availability of nutrients and the soil structure. These all influence crop growth and the growth of the crops determines the soil cover and the erosion protection afforded.

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EROSION CONTROLLED BY TERRACES.

By H. B. Atkinson and Orville E. Hays; Wis. Agr. Expt. Sta. Bul. 494. June 1951.

Terraces are effective in controlling the lengths of slopes in a soil conservation program.

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NATIVE GRASSLAND JUDGING.

By Edd Roberts; Okla. Ext. Div., A & M College, Cir. 557.

Grassland conservation can be taught by the same principle as land appreciation. Placing sheets have been designed whereby the individual makes the placings regarding the range or native pasture on the same principle as land appreciation work has been designed.

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PRECIPITATION IN TENNESSEE RIVER BASIN.

By C. E. Blee, James S. Bowman, and Albert S. Fry; Tenn. Valley Authority Rpt. No. O-243-199. October 1951.

This paper presents detailed precipitation for the Tennessee River Basin in its entirety and by subdivisions for the month of October 1951.

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PROGRESS REPORT, 1951: BRUSH CONTROL RESEARCH AT THE RED PLAINS CONSERVATION EXPERIMENT STATION GUTHRIE, OKLAHOMA.

By Harry M. Elwell and Maurice B. Cox; Okla. Agr. Expt. Sta. Mimeo. Cir. M-220. April 1951.

This paper reports the results of a study aimed at developing methods and procedures for obtaining a protective grass cover for erosion control under continuous maximum production from brush covered land.

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CONSUMPTIVE USE OF WATER.

By Harry F. Blaney; Amer. Soc. of Civil Engineers Proc., Vol. 77, Separate No. 91. October 1951.

Consumptive use (or evapo-transpiration) includes loss of water by evaporation of moisture from the surface of the soil and loss from interception by vegetative cover and plant transpiration. This paper discusses the subject of consumptive cover and plant transpiration. This paper discusses the subject of consumptive use with special reference to definitions, methods, and results of research. The procedure for determining consumptive use of water in valley areas from climatology, irrigation, and other data is outlined. The results of experimental measurements of evapo-transpiration by agricultural crops and natural vegetation are presented briefly. The paper provides the practicing engineer the information required to estimate consumptive use in water utilization investigations.

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FERTILIZER USE AND CROP YIELDS IN THE UNITED STATES.

By W. E. Colwell, J. P. Conrad, K. C. Berger, Mack Drake, D.B. Ibach, and R. Q. Parks; Fertilizer Work Group, Nat. Soil and Fert. Research Committee, Report No. 5. October 1951.

This is one of five initial reports of the Fertilizer Work Group of the National Soil and Fertilizer Research Committee. It summarizes crop production potentials at different levels of fertilizer supply.

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A SUGGESTED METHOD FOR ESTIMATING RUNOFF - PART I. APPLIED TO SINGLE-UNIT WATERSHEDS.

By H. N. Holtan and M. H. Kirkpatrick, Jr.; USDA, SCS and Va. Agr. Expt. Sta. Preliminary Draft for In-Service Review by Hydrologists and Cooperating Specialist. June 1950.

An effort is made in this paper to isolate and comprehend hydrologic principles involved in the processes of runoff from rainfall.

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USE OF SNOW SURVEYS IN PLANNING REGULATION OF COLUMBIA RIVER FLOODS.

By R. A. Work, H. G. Wilm, and Morlan W. Nelson; Ore. Agr. Expt. Sta. July 1951, Also Proc. 19th Ann. Meet. of the Western Snow Conference, Victoria, British Columbia, April 19-20. 1951. Mimeo. July 1951.

This paper presents a practical method for making predictions of both volumetric yield and flood discharges. It uses available data on the water stored in snow early in the spring and on

subsequent precipitation. By statistical means, the predictions are accompanied by estimates of their error and of the probable limits within which the real yield or flood discharge is likely to fall.

THE SILTING OF CARBONDALE RESERVOIR.

By B. O. Larson, A. A. Klingebiel, E. L. Sauer, S. W. Melsted, and R. C. Hay; Ill. Dept. of Registration and Education, State Water Survey Div., Urbana. Report of Investigation No. 9. 1951.

Carbondale Reservoir shows a capacity loss of 0.63 percent per year. In 22.1 years the lake has lost 13.9 percent of its original 1,386 acre-feet capacity. The lake sediment physical and chemical composition is very similar to that of the predominant surface soils of the watershed. Erosion classified as "severe" and "very severe" is occurring on 46.7 percent of the watershed area, while 1.3 percent of the area is considered "destroyed land".

THE SILTING OF LAKE BRACKEN.

By B. O. Larson, H. M. Smith, E. L. Sauer, and S. W. Melsted; Ill. Dept. of Registration and Education. State Water Survey Div., Urbana. Report of Investigation No. 10. 1951.

Lake Bracken has lost to sediment 14.9 percent of its original storage capacity of 2,681 acre-feet during the 25.6 years of its existence. Deposition has been considerably heavier in the extreme upper end of all arms of the reservoir, particularly above road fills across the lake. The sediment in the reservoir represents a yearly loss of plant food equivalent to approximately 80 pounds of a 25-5-4 fertilizer per acre of cropland in the watershed. Comparisons of chemical characteristics of sediment samples taken in 1936 and 1947 suggests that during the period 1936 to 1949 relatively more sediment came from erosion of subsoil materials than during the period 1923-1936. Apparently erosion which occurred on surface soils prior to 1936 has progressed into the subsoils in more recent years. It is estimated that 95 percent of the sediment reaching the reservoir comes from sheet erosion. That is, it is a result of uncontrolled raindrop splash.

IRRIGATION AND DRAINAGE INVESTIGATIONS WEBER BASIN PROJECT, UTAH.

By Wayne D. Criddle and W. W. Donnan; Typed rpt., USDA, SCS. December 1, 1951.

This is a report of the investigations of

irrigation and drainage problems in the Weber Basin, Utah.

RADA FOR ALGAE.

By Curtis Bowser; The Reclamation Era, Vol. 37, No. 11, pp. 247-248. November 1951.

This paper explains how RADA, or rosin Amine D Acetate, is being used to destroy algae in canals and other bodies of water.

WATER REPORT.

By R. A. Work and Clyde E. Houston; The Reclamation Era, Vol. 37, No. 11, pp. 249-251, and 260. November 1951.

This paper discusses the water-supply situation for the Columbia River Basin.

SHORT CUTS TO WEED KILLING CALCULATIONS: PART 6- PREPARING WEED-KILLING SOLUTIONS WITH LIQUID.

By John T. Maletic; The Reclamation Era, Vol. 37, No. 11, pp. 256-257. November 1951.

This paper explains the procedure to be followed in preparing a spray solution with a liquid.

NEW CHECK FOR FARM DITCHES.

By Marvin N. Shearer; The Reclamation Era, Vol. 37, No. 11, pp. 258-259. November 1951.

This paper describes a permanent check structure for use in ditches which has removal panels which house the check boards. This small dam can be lifted easily out of its base making it possible to remove the entire obstruction from wall to wall.

CONSERVATION PROBLEMS AND ACHIEVEMENTS ON SELECTED MIDWESTERN FARMS.

By E. L. Sauer, H. O. Anderson, R. H. Blosser, P. E. McNall, and O. J. Scoville; Ohio Agr. Expt. Sta. Special Cir. 86. July 1951.

This circular attempts to show how conservation problems vary from place to place, and how different situations call for different remedies. Problems that individual farmers have encountered, progress made, conservation practices used, and resulting changes in farm production, costs, and income are illustrated by records from actual

farms.

PASTURE IMPROVEMENT WITH 10-10-10 FERTILIZER.

By C. J. Chapman; Better Crops with Plant Food, Vol. 35, No. 10, pp. 13-14 and 45-46. December 1951.

Nitrogen-treated permanent grass pasture will furnish a week's earlier grazing, two to three times as much feed, a more palatable forage with higher protein content, and a thicker turf with greater moisture-holding capacity. It will reduce runoff, carry cattle for a longer period into the summer months, and will help to choke weeds. It all adds up to more low-cost, home-grown protein feed, and fits into our national program of soil conservation and a grassland type of farming. Nitrogen backed up with phosphate and potash in a complete fertilizer such as 10-10-10 will maintain high-level production over a period of many years.

SOIL FERTILITY AND PASTURES.

By Firman E. Bear; Better Crops with Plant Food, Vol. 35, No. 10, pp. 15-18. December 1951.

This article explains that it requires fertile soil to produce good pastures. By proper fertilization and management, however, much land is most profitable when devoted to grass.

M. V. COREY, MIDDLETOWN, R. I., 1951 N. E. GRASSLAND WINNER.

By H. M. Hofford; Better Crops with Plant Food, Vol. 35, No. 9, pp. 15 and 40-41. November 1951.

Money spent for fertilizer is considered to be the best investment made on the Corey farm. Split application of fertilizer, spring and fall application, is considered to be the major factor in the outstanding success of Corey's grassland farming. A 5-10-10 fertilizer at seeding time and 600 to 1800 pounds of 0-20-20 fertilizer per acre for topdressing, applying it in both the spring and the fall on some pastures, and about 400 pounds at each season on others. Ladino clover for pasture, and alfalfa and red clover in combination with grasses for second and third cutting hay constitute the backbone for Corey's feeding program. Many of the pasture plants are seeded by throwing the seed on the ground in early March. Each field is carefully clipped after the cows have finished grazing.

FERTILIZER RECOMMENDATIONS BASED ON SOIL TESTS.

By O. T. Coleman; Better Crops with Plant Food, Vol. 35, No. 9, pp. 16-22 and 45. November 1951.

This paper explains the importance of soil testing in reducing the risk in production and the resulting net returns by fertilizing the soil so that plant food will be eliminated as the limiting factor in plant growth.

CONCERNING "BIO-DYNAMIC FARMING" AND "ORGANIC GARDENING".

By Solman A. Waksman; Better Crops with Plant Food, Vol. 35, No. 9, pp. 23-24 and 43-44. November 1951.

This paper discusses "bio-dynamic farming" and "organic gardening" and attempts to present the role of organic matter in its truelight in present dry farming.

IMPROVING PASTURES IN ARKANSAS.

By Edgar A. Hodson; Better Crops with Plant Food, Vol. 35, No. 9, pp. 25 and 44. November 1951.

The author discusses the pasture improvement program being developed in Arkansas. It is based on a sound plan, fertilizers and lime, good land preparation use of grasses and legumes best suited to the soils, and good management.

THE EVALUATION OF SOILS AND THE DEFINITION OF QUALITY CLASSES FROM STUDIES OF THE PHYSICAL PROPERTIES OF THE SOIL PROFILE IN THE FIELD.

By G. R. Clarke; The Jour. of Soil Sci., Vol. 2, No. 1, pp. 50-60. January 1951.

The relative productivity of certain soil series was determined from an evaluation of certain physical characteristics of the soil profile which were measured in the field. The evaluation was based on the assumption that the most important physical properties of a soil affecting its productivity are its texture, its depth, and the goodness of its drainage. These investigations were designed to attempt to evaluate the major physical attributes of the soil profile and to determine to what extent such characteristics as texture depth of soil and quality of drainage affected the inherent productive quality of the soil.

A REVIEW OF RECENT WORK ON SOIL ORGANIC MATTER. PART I.

By J. M. Bremner; The Jour. of Soil Sci., Vol. 2, No. 1, pp. 67-82. January 1951.

This paper deals with a few of the important developments in the field of soil organic matter during recent years.

FEEDING SALT TO LIVESTOCK.

By E. B. Stanley; The Reclamation Era, Vol. 37, No. 12, pp. 268-269, and 288. December 1951.

This paper describes how cattlemen are mixing salt with cottonseed meal and other supplementary foods to livestock on the open range or pasture. As a result the range animals eat what is good for them, and no more. In addition this self-regulating use of supplementary feed helps to solve the problem of supporting livestock on drought-stricken desert land.

EROSION CONTROL AT SHASTA AND KESWICK.

By Louis G. Temple; The Reclamation Era, Vol. 37, No. 12, pp. 272-273. December 1951.

This paper describes how the soil erosion problem is being handled on the Keswick Reservoir watershed in northern California.

ROTENONE AT BUMPING LAKE.

By Earl L. Smith; The Reclamation Era, Vol. 37, No. 12, pp. 280-281. December 1951.

The author discusses the use of rotenone in connection with the eradication of suckers, squawfish, and shiners which have driven trout and other favorite sporting fish from Bumping Lake.

MECHANICAL SIPHON PRIMER.

By Larry Swarner; The Reclamation Era, Vol. 37, No. 12, pp. 282-283. December 1951.

This paper describes a mechanical gadget constructed and used to prime irrigation system tubes.

SHORT CUTS TO WEED KILLING CALCULATIONS. PART 7. HOW TO PREPARE WEED KILLERS FOR WOODY PLANTS.

By John T. Maletic; The Reclamation Era, Vol. 37, No. 12, pp. 284-285. December 1951.

The author presents a nomogram which may be used

for determining concentration, volume of herbicide, or volume of diluent for liquid type herbicides.

LAND USE PLANNING.

By H. C. M. Case, Chairman of Committee on Productive Capacity of Illinois Agriculture. Ill. Mimeo. AE-2803c. 7-5-51.

This paper illustrates the use of data in discussing the productive capacity of soils in 1952 and long-time land use on a county basis.

REGIONAL ENGINEERING HANDBOOK, PART THREE - CONSERVATION IRRIGATION.

By T. S. Buie; USDA, SCS, Spartanburg, S. C. Book Number 291. November 1951.

This handbook is for use in Ala., Fla., Ga., Ky., Miss., N.C., S. C., Tenn., Va., and Puerto Rico.

RESEARCH WILL ATTEMPT TO GIVE DEFINITE ANSWERS TO QUESTIONS ON HALOGETON POISONING.

By L. A. Stoddart and C. Wayne Cook; Utah Agr. Expt. Sta. Farm and Home Sci., Vol. 12, No. 4, pp. 70-71 and 83. December 1951.

Halogeton, like other poisonous plants, does not necessarily kill animals wherever it occurs. It is not like strychnine, where a chance mouthful will cause death. Animals are relatively safe if other forage is eaten along with small amounts of poisonous plants. It is only when animals eat most poisonous plants as a major part of their diet that they are killed. Livestock can graze these ranges without great danger if stock operators know the plant and if the land and the livestock are intelligently managed.

PERSISTENCE OF CHLORINATED HYDROCARBON INSECTICIDES IN TURF TREATED TO CONTROL THE JAPANESE BEETLE.

By Walter E. Fleming, Warren W. Maines, and Leon W. Coles; USDA, ARA-BEPQ, C-829. November 1951.

The persistence of various chlorinated hydrocarbon insecticides applied to turf for control of larvae of the Japanese beetle was determined by means of bioassays and chemical analyses of the treated turf. In the bioassays larvae and adults were used as the test insects. The close agreement between the chemical and biological determinations of residues of DDT, TDE, toxaphene, and chlordane suggests that the composition of

these toxicants did not change significantly while they were in the turf. The percentage loss of DDT and chlordane in the turf was usually much the same in plots receiving widely different amounts of toxicant. The chlordane decreased more rapidly than the DDT -- to 30 percent of the amount applied in 1-1/2 years whereas this percentage of DDT still remained after 6 years. After 40 months, 46 percent of the toxaphene and 44 percent of the TDE remained, and after 12 months 67 percent of the dieldrin and 33 percent of the aldrin.

BOOKS, BOOKLETS, BULLETINS ON SOIL AND WATER CONSERVATION.

By Phoebe O'N. Faris; USDA, SCS, Agriculture Information Bulletin No. 63. September 1951.

These references are designed to bring us up to date in the field of soil- and water-conservation literature. The listings and abstracts are arranged by years, with the latest publications at the top of each section. This is for the benefit of readers who want to locate quickly the most recent books, booklets, and bulletins on different phases of this important subject.

SHORT CUTS TO WEED KILLING CALCULATIONS: PART 8 - HOW TO APPLY AROMATIC SOLVENTS TO CONTROL WATER-WEEDS.

By John T. Maletic; The Reclamation Era, Vol. 28, No. 1, pp. 18-19. January 1952.

Successful control of pondweeds depends upon obtaining a specified concentration of solvent during a given time interval and accurately measuring the ditch flow. A nomogram is given which will quickly compute the amount of aromatic solvents needed during the specified contact time. Making this calculation is the first step toward effective control. The second step is to calibrate the spray rig so that the discharge from each nozzle introduces the chemical into the water at the correct rate. Both steps are essential if chemical wastage is to be prevented and good kills obtained.

EFFECT OF CRIMSON CLOVER ON THE YIELD AND CHEMICAL COMPOSITION OF COOL SEASON GRASSES.

By E. C. Holt, R. C. Potts, and L. C. Kapp; Texas Agr. Expt. Sta. Prog. Rpt. 1403. September 25, 1951.

This test showed that forage yields were increased by planting a legume, such as crimson clover, with cool season grasses. Yields of the grass component of the mixtures were decreased

somewhat over the grasses grown alone, but total yields were increased. The protein content of the grass was increased by the presence of a legume. The influence of the legume on summer survival of the grasses was not determined because of an extended drought during the last half of 1950. There were differences in the ability of the grasses and clover to grow together. The highest yielding mixture was Texas Rescue 46-clover, with the amount of each component in the mixture almost equal.

COMPOSITION OF FLORIDA-GROWN VEGETABLES: III. EFFECTS OF LOCATION, SEASON, FERTILIZER LEVEL AND SOIL MOISTURE ON THE MINERAL COMPOSITION OF CABBAGE, BEANS, COLLARDS, BROCCOLI, AND CARROTS.

By Byron E. Janes; Fla. Agr. Expt. Sta. Bul. 488. December 1951.

This bulletin, third of a series on the composition of Florida-grown vegetables, deals with the mineral composition of vegetables grown on a series of plots located in several different vegetable-growing areas in the State.

The largest differences in mineral composition were associated with the type of crop and location where grown. Soil type, or at least soil environment, was the main factor associated with location which influenced mineral composition.

CONTROL OF SEEDLING GRASS IN COTTON.

By H. E. Rea, H. F. Miller, Jr., and H. P. Smith; Texas Agr. Expt. Sta. Prog. Rpt. 1412. October 28, 1951.

All the other systems of weed control tested were more economical for the control of seedling grass in the cotton drill than hand-thinning and hand-hoeing.

The cost of early-season control was reduced considerably by the use of rotary hoeing with and following machine thinning, pre-emergence chemical treatment of hill-dropped cotton, pre-emergence chemical treatment followed by two post-emergence oilings of the cotton drill, and by post-emergence oiling of cotton planted to a stand.

GRASS PASTURES IN CENTRAL FLORIDA.

By E. M. Hodges, D. W. Jones and W. G. Kird; Fla. Agr. Expt. Sta. Bul. 484. November 1951.

Pasture improvement has progressed from an unknown and questionable innovation to a sound practice giving full value to the livestock

industry. While new grasses and planted pastures are increasingly important, the native range continues to be the foundation of the Florida beef cattle business. Some cattle are kept on improved pasture continuously, but most of them have access to native grazing land during at least part of the year. Many skillful and experienced ranchers are maintaining their herds, at a profit, entirely on native grazing land. The carrying capacity of an area may be increased by improving part of it to be used for winter grazing. When this is done, planted and fertilized pastures should be managed to supply feed when the native range is poorest. This method of handling yields substantial returns from improved pasture and permits more efficient use of native land. Fall weaning of calves is an instance where high quality grazing has special value.

Most improved pastures in central Florida are devoted to beef production, but dairymen are becoming aware of the value of high quality pasture for reducing feed costs and maintaining the health of cattle during much of the year.

Pasture improvement is a long-term project. It should receive careful planning and not be entered into either hastily or without serious consideration of the problems involved. Upkeep, as well as initial cost, needs to be considered, since adequate financing is an essential part of a pasture plan.

SHORT CUTS TO WEED KILLING CALCULATIONS: PART 9-CALIBRATING THE RIG FOR AROMATIC SOLVENTS APPLICATIONS.

By John T. Maletic; The Reclamation Era, Vol. 38, No. 2, pp. 32-33. February 1952.

Aromatic solvents is a new chemical used to kill waterweeds. Compared to other methods of waterweed control, this method is inexpensive. To prevent overuse of materials and to assure success of aromatic solvents applications, it is just as important to calibrate the equipment for waterweed control as it is for land weed control.

Part 8 of this series appeared in the January issue of the Reclamation Era. It showed how to determine the amount of aromatic solvents needed. This paper explains how to calibrate the rig for applying aromatic solvents and presents a spray rig calibration nomogram for herbicide applications in irrigation ditches.

EXPERIMENTS WITH RADIOACTIVE PHOSPHATES IN 1949.

By F. W. Parker; USDA, ARA-PISAE Memo to Cooperators on Radio-Phosphorus Studies. November 1949.

This is a compilation of outlines of radio-phosphorus experiments conducted during 1949.

LIST OF REFERENCES TO BORON LITERATURE.

American Potash Institute, 1102 Sixteenth St., N. W., Washington 6, D. C. Mimeo B-55. February 1952.

This is a list of literature on boron published during the latter part of 1950.

THE USE OF CHLORDANE FOR THE CONTROL OF CRAB-GRASS (A PRELIMINARY REPORT).

By B. H. Grigsby; Mich. Agr. Expt. Sta. Quarterly Bulletin, Vol. 34, No. 2, pp. 158-161. November 1951.

The results obtained in greenhouse trials indicate that chlordane has the property of delaying emergence and preventing germination of crabgrass seeds. It also has some effect upon the germination of other grass seeds. Best results may be expected when the technical resin form of chlordane is used in an oil carrier. The dosage rates used in these trials, 5 to 25 pounds were within the range used for the control of grubs and other soil-inhabiting insects.

Results from applications of chlordane in crabgrass spray oil, or in kerosene, showed clearly that the insecticide would increase the crabgrass-killing properties of these oils without causing undesirable effects on turf grasses. The method described enables one to secure a quick kill of crabgrass with a single application of spray mixture and also leaves a residue in the soil which may prevent reinfestation later in the season. Best results were obtained when kerosene was used as the carrier.

SOIL MANAGEMENT, SOIL SENSE AND SOIL CONSERVATION.

By C. L. W. Swanson; Jour. of Soil and Water Conservation, Vol. 6, No. 4, pp. 183-184. October 1951.

The American public has been frightened by the grim predictions of world food shortages by alarmists concerned with the land and its care. In the long run this is bad psychology. Statements are not enough. We need some straight thinking. Saving soil won't solve all the world's food ills. It will help tremendously, but it is more a complicated political-economic-sociological problem.

A GRAIN PLOT HARVESTER.

By L. S. Robertson and C. M. Hansen; Mich. Agr. Expt. Sta. Quarterly Bul., Vol. 34, No. 2, pp. 147-148. November 1951.

This paper describes a small harvesting machine which has been developed to harvest grain on small test plots. It is referred to as a "power-cradle". It uses a commercial, oscillating, sickle-type mower which cuts a 3-foot swath directly ahead of the power unit.

A grain reel to aid in cutting the grain and a sheet metal apron to catch the cut grain were added to this mower. The grain reel is ground-driven by two 10-inch-diameter wheels which were added to support the cutter bar. Adjustments can be readily made to vary the height and position of the reel with respect to the cutter bar. The speed of the reel and height of the cutter bar are also adjustable. During the 1951 harvest season extra handle bars were added to accommodate a tall operator. The machine is propelled by a 1-1/2-horsepower gasoline engine which drives the two rear wheels by means of a hand clutch.

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SPECIAL WATER SUPPLY FORECAST FOR THE RIO GRANDE DRAINAGE BASIN 1952 SEASON.

By Homer J. Stockwell; SCS Div. of Irrigation Engineering, Mimeo. Feb. 15, 1952.

Because of unusually heavy snow cover on the Rio Grande watershed as of February 1, 1952, this special forecast of the flow of the Rio Grande at principal gaging stations for the 1952 snow-melt season is prepared. During the past several months a considerable study has been made of the relationship of snow cover, precipitation, temperatures, and other antecedent conditions to the subsequent flow of the Rio Grande. The best forecasts developed are reported. It is believed that forecasts based on April 1 data are seasonably accurate and based on data including May 1 are very accurate. Graphical illustrations of these relationships as of April 1 are attached to the article.

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THE EFFECT OF GROUND WATER-LEVEL UPON PRODUCTIVITY AND COMPOSITION OF FENLAND GRASS.

By A. Eden, G. Alderman, C. J. L. Baker, H. H. Nicholson, and D. H. Firth; The Jour. Agr. Sci., Vol. 41, No. 3, pp. 191-202. July 1951.

Studies were made of the effects of varying ground water-levels upon the productivity and composition of Italian ryegrass grown on a calcareous light peat in the Fenland area. Six cuttings were made during the season at 3-to 4-

weekly intervals. High ground water-level (approximately 15 in. below ground surface) had a very deleterious effect on the total yield of fresh grass and of dry matter. High water-level apparently interfered with nitrogen metabolism in the soil, and considerably lower percentages of crude protein were found in the grass growing on the high water-level plots than at the other levels. On the otherhand, the percentage of crude fiber remained fairly constant for all levels of ground water. High water-level also had a depressing effect on the percentage of potassium, magnesium, and chlorine in the grass.

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THE SEASONAL OUTPUT OF PASTURES SOWN WITH ULTRA-SIMPLE SEED MIXTURES.

By G. Pearson Hughes; The Jour. Agr. Sci., Vol. 41, No. 3, pp. 203-213. July 1951.

An attempt was made to evaluate the role of seven intra-simple seed mixtures in the production of pasture during the grazing season. The individual value of each mixture was assessed and its period of production described. Pasture output was measured in dry matter and protein yields along with live-weight grains obtained with fattening cattle.

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EFFECTS OF FORTY YEARS OF CROPPING UNDER IRRIGATION.

By K. W. Hill; Sci. Agr., Vol. 31, No. 8, pp. 349-357. August 1951.

This paper reports the yields and trends of yields over a 40-year period in a 10-year irrigated crop rotation situated on a typical southern Alberta soil. While the native prairie soils have produced abundant yields under irrigation, indications are that applications of phosphate fertilizer and manure are essential to the maintenance of high yields, particularly of such crops as sugar beets and alfalfa. Under a cropping practice, which included six years of alfalfa in a 10-year rotation, the nitrogen content of the soil was increased consistently over a 30-year period but now may be levelling off. The percentage of organic matter has decreased over a 40-year period.

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THE ORGANIC FARMING MYTH.

By R. I. Throckmorton; Country Gentleman. September 1951.

This paper states that the broad pro and con claims of the "organic farmers" is bunk. There is nothing to substantiate the claims of the organic-farming cult. Mineral fertilizers, lime,

and organic matter all are essential in a sound fertility program. Chemical fertilizers stand between us and hunger.

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PUTTING RANGE MANAGEMENT FACTS TO WORK.

By Alan Rogers; Jour. Range Mgt., Vol. 4, No. 5, pp. 327-329. September 1951.

Putting range management facts to work is merely selling good management. It is the job of getting the livestock operator to use the facts. The approach to this problem should be practical, factual, and straightforward. This paper illustrates how it can be done.

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MEASURING CONSUMPTION AND DIGESTIBILITY OF WINTER RANGE PLANTS BY SHEEP.

By C. Wayne Cook, L. A. Stoddart, and Lorin E. Harris; Jour. Range Mgt., Vol. 4, No. 5, pp. 335-346. September 1951.

A method for determining digestibility of native forage under range conditions was developed and used on desert ranges in northwestern Utah during the winter grazing season of 1950-51. Briefly the method consists of grazing within sheep enclosures on both pure and mixed stands of native forage plants.

Forage was sampled both before and after grazing, and by difference in weight and chemical analyses the degree of utilization and nitrate investigated were calculated.

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A TRACTOR MOUNTED METER ATTACHMENT FOR SIDE BAND APPLICATION OF FERTILIZER TO TOBACCO PLOTS.

By A. I. Magee and W. A. Scott; Sci. Agr., Vol. 31, No. 10, pp. 454-456. October 1951.

A belt-type, walking-fertilizer distributor was modified to operate in conjunction with the drive mechanism of commercial fertilizer attachment for a single-row tractor cultivator.

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THE PROBLEM OF SAFE YIELD IN INSULAR GHYBEN-HERZBERG SYSTEM.

By Chester K. Wentworth; Amer. Geophys. Union Trans., Vol. 32, No. 5, pp. 739-742. October 1951.

Where the lower boundary of fresh water in a Ghyben-Herzberg lens is of area comparable to the area of the aquifer, changes in vertical position yield large amounts of water

which may be equivalent to several months or years of annual increment from rainfall. Draft on such a system may not immediately develop indication of water shortage but may trend over a long period toward conditions unfavorable to maintenance of a desired quantity or quality of water. Changes in the amount of ground-water suggest that storage is being depleted. To determine in such a system what yield is safe is as much a social problem as a hydrologic one, and involves contemporary and future patterns of normal and emergency use, viewed in the light of long-term conservation aims. Physical and hydraulic data are essential but ultimate evaluation must take account of the probable future state of the community and existence or non-existence of alternate future supplies.

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RED-YELLOW PODZOLIC SOILS OF THE SOUTHEASTERN UNITED STATES: I. MORPHOLOGY OF THE RUSTON, STEPHENSVILLE, BOSWELL, WINDTHORST, CAHABA, LEAF, AND AXTELL SERIES.

By E. H. Templin, I. L. Martin, and R. S. Dyal; Agron. Jour., Vol. 43, No. 10, pp. 476-482. October 1951.

Composite descriptions including summarizations of cation-exchange and mechanical analyses of replicate profiles for 7 principal series of Red-Yellow Podzolic soils from 4 geographic areas - the semi-humid west cross timbers, the low-humid Post-Oak Belt, the midhumid Gulf Coastal Plains, and the midhumid Atlantic Coastal Plain - are given and compared.

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RED-YELLOW PODZOLIC SOILS OF THE SOUTHEASTERN UNITED STATES: II. CHARACTER OF THE CLAY FRACTION OF RUSTON, STEPHENSVILLE, BOSWELL, WINDTHORST, CAHABA, LEAF, AND AXTELL.

By R. S. Dyal, I. L. Martin, and E. H. Templin; Agron. Jour., Vol. 43, No. 10, pp. 482-487. October 1951.

This paper summarizes the laboratory data on the profiles discussed in Part I of this series, with emphasis on the character of the clay minerals.

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COMPARISONS OF THE PRODUCTIVITY OF PERMANENT AND ROTATION PASTURES ON PLOWABLE CROPLAND.

By H. L. Ahlgren, J. M. Sund, C. E. Zehner, N.H. Allen, and E. J. Graul; Agron. Jour., Vol. 43, No. 10, pp. 500-503. October 1951.

This paper reports the results of studies started in 1944 to obtain additional information on the comparative effectiveness of various cropping

systems in producing high yields of good quality feed. October 1951.

THE DECOMPOSITION OF A PENTACHLOROPHENO WHEN APPLIED AS A RESIDUAL PRE-EMERGENCE HERBICIDE.

By H. C. Young and J. C. Carroll; Agron. Jour., Vol. 43, No. 10, pp. 504-507. October 1951.

The rate of decomposition of pentachlorophenol in soils with low and high organic-matter content was determined at different levels of moisture and temperature.

Results indicate that pentachlorophenol decomposes more rapidly in soils of high than in those of low organic content. The rate of decomposition is more rapid when the moisture content of the soil is near the moisture equivalent and when the soil temperature approaches the optimum for microbiological activity.

IONIC ACTIVITIES IN ION-EXCHANGE SYSTEMS.

By K. L. Babcock, L. E. Davis, and Roy Overstreet; Soil Sci., Vol. 72, No. 4, pp. 253-260. Oct. 1951.

Specifying a mole fraction does not fix the activity of an ion in the adsorbed state. The partial modal free energy, and hence the activity, are determined by specifying a volume of solution composition. For consistency, the infinitely dilute solution was chosen as the reference state. On this basis, the activity of an adsorbed ion is the same as its activity in the solution phase. If the activity of an ion in the soil solution can be estimated, the activity of an adsorbed ion is determined.

AVAILABILITY OF MOLYBDENUM AS INFLUENCED BY LIMING.

By W. O. Robinson, Glen Edgington, W. H. Atmiger, and A. V. Breen; Soil Sci., Vol. 72, No. 4, pp. 267-274. October 1951.

The molybdenum content of alfalfa, crimson clover, and Austrian winter peas grown in acid soil was greatly increased by liming. The pea and crimson clover content was increased beyond the lower toxic limit for cattle.

MINERAL COMPOSITION OF ORCHARD GRASS GROWN ON PACHAPPA LOAM SALINIZED WITH VARIOUS SALTS.

By C. H. Wadleigh, H. G. Gauch, and Maria Kolisch; Soil Sci., Vol. 72, No. 4, pp. 275-282.

When different levels of various salines were added to Pachappa loam, the associated decrease in growth of orchard grass can be largely accounted for by the decreased physiological availability of the soil water. The depressive action of added Na_2CO_3 and NaHCO_3 seems to be due to the lethal effect of high levels of concentration of the calcium ion in the soil solution when the associated anion is either chloride or nitrate.

COMPATIBILITY OF RHIZOBIA WITH SEED PROTECTANTS.

By Marcia Ruhloff and Joe C. Burton; Soil Sci., Vol. 72, No. 4, pp. 283-290. October 1951.

This study was planned to study the relative toxic effects of various seed chemicals to rhizobia, the variation in tolerance between different species of rhizobia and the influence of seed chemicals on numbers of rhizobia surviving under simulated soil conditions.

A TECHNIQUE FOR MEASURING SOIL-MOISTURE TENSION IN RAPIDLY CHANGING SYSTEMS.

By R. D. Miller; Soil Sci., Vol. 72, No. 4, pp. 291-301. October 1951.

This paper describes a new form of potentiometer which makes it possible to eliminate lag and to lessen materially the amount of water transferred.

THE RELATION OF MANGANESE TO THE CAROTENE AND VITAMIN CONTENTS OF GROWING CROP PLANTS.

By O. J. Burger and S. M. Hauge; Soil Sci., Vol. 72, No. 4, pp. 303-313. October 1951.

These experiments indicate that after the manganese deficiencies have been corrected, additional amounts of manganese have no stimulatory effect on the production of carotene and the other constituents studied.

IRRIGATION OF SOILS AND SOIL COLLOIDS: I. METHODS FOR SIMULTANEOUS DETERMINATION OF TWO CATIONIC ACTIVITIES.

By E. O. McLean, S. A. Barber, and C. E. Marshall; Soil Sci., Vol. 72, No. 4, pp. 315-325. October 1951.

The theoretical requirements for the determination of two cations simultaneously are discussed,

and the various equations are given. Determination of the appropriate mobility ratio for the membrane electrode is essential. Practical considerations in the determination of mobility ratios are discussed; namely, membrane individuality, variation with concentration, and variation with cationic proportions in mixtures. The case of calcium-potassium mixtures is used as a typical example, and the accuracy of calcium estimations for various proportions of calcium and potassium is discussed.

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A RANGE LAND RENTAL SYSTEM BASED ON GRAZING CAPACITY AND THE PRICE OF BEEF.

By J. A. Campbell and V. A. Wood; Jour. Range Mgt., Vol. 4, No. 6, pp. 370-374. November 1951.

This paper presents a formula by which the rent due in any particular year might be readily determined.

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HISTORICAL SKETCH OF BARILLA (HALOGETON GLOMERATUS).

By William A. Dayton; Jour. Range Mgt., Vol. 4, No. 6, pp. 375-381. November 1951.

This is a chronological historical sketch of halogeton.

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WOODLAND FORAGE IN THE ARKANSAS OZARKS.

By Ralph A. Read; Jour. Range Mgt., Vol. 4, No. 6, pp. 391-396. November 1951.

This is a report of studies made of forest range grazing in the Arkansas Ozarks to determine if the practice really fits into the best use of Ozark forests and farms.

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THE EFFECT OF HARVESTING PRACTICES ON YIELD AND WINTER SURVIVAL OF ALFALFA UNDER IRRIGATION.

By R. E. McKenzie; Sci. Agr., Vol. 31, No. 11, pp. 457-462. November 1951.

A study with Grimm alfalfa was conducted to determine a desirable type of harvesting practice to follow under irrigated conditions in western Canada. It was concluded that the most economical cost of producing alfalfa hay would be when two cuttings per season were harvested at the early flowering stage of growth.

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SEEDING GRASS IN THE ROW WITH SOYBEANS REDUCES SOIL EROSION.

By J. J. Pierre and E. M. Brown; What's New in Crops and Soils; Vol. 4, No. 2, p. 21. November 1951.

Grass can be established successfully by seeding them with soybeans in rows spaced for cultivation without reducing the yield of beans. Whether the grasses are harvested for seed or used as forage, seeding grass with soybeans can reduce erosion.

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LAND PREPARATION FOR IRRIGATION AND DRAINAGE.

By Ivan D. Wood; Agr. Eng., Vol. 32, No. 11, pp. 597-599. November 1951.

This paper discusses the methods used in preparing land for irrigation in both the west and the east.

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THE DRAINAGE OF IRRIGATED LANDS.

By C. R. Maierhofer; Agr. Eng., Vol. 32, No. 11, pp. 613-614. November 1951.

This paper discusses the drainage of irrigated land. Special emphasis is given to the handling of excessive salts in connection with irrigation.

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A GRAPHIC METHOD OF SOLVING SPRINKLER IRRIGATION APPLICATION PROBLEMS.

By James E. Garton; Agr. Eng., Vol. 32, No. 11, p. 615. November 1951.

A monograph is presented which relates plot size, sprinkler discharge, and operating time needed for sprinkler irrigation systems.

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ARE POINT ROWS NECESSARY ON TERRACED LAND?

By Paul Jacobson; Jour. Soil and Water Conservation, Vol. 6, No. 4, pp. 172-174. October 1951.

The author describes methods which when used will eliminate a great number of the point rows on terraced land.

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PROBLEMS OF DRAINAGE IN A SOIL AND WATER CONSERVATION PROGRAM.

By Paul J. Zwerman; Jour. Soil and Water Conservation, Vol. 6, No. 4, pp. 185-186 and 194. October 1951.

This paper discusses drainage problems encountered in establishing soil and water conservation programs.

CONSERVATION EFFECTS OF CROP ROTATION ON A SANDY SOIL IN VEGETABLE PRODUCTION.

By O. R. Neal and G. D. Brill; Jour. Soil and Water Conservation, Vol. 6, No. 4, pp. 187-190, and 199. October 1951.

Maintenance of favorable soil physical conditions appears essential for both conservation and for maintenance of crop yields. Systematic rotation of cultivated crops with grass-legume mixtures is a practical method of improving soil physical properties. A sandy coastal plain soil under rotation management has shown consistently reduced runoff and erosion and increased crop yields as compared with continuous cultivation. Such rotation management appears an essential part of the conservation program for these soils.

FACTORS AFFECTING RATE OF WATER INTAKE IN TEXAS BLACKLANDS.

By William R. Elder; Jour. Soil and Water Conservation, Vol. 6, No. 4, pp. 195-197 and 199. October 1951.

Growing deep-rooted legumes in rotation with cotton and other cash crops is increasing water intake of blackland soils by bringing back good soil conditions.

CONSERVATION FARMING ON EXPERIMENTAL WATERSHED INCREASES FARM INCOME.

By John A. Allis; Jour. Soil and Water Conservation, Vol. 6, No. 4, pp. 200-201. October 1951.

Corn raised under conservation methods last year was worth at harvest time from \$7.20 to \$10.80 more an acre than corn raised by up-and-down hill farming.

SOIL LAYERS CAUSING RUNOFF FROM HARD-LAND WHEAT FIELDS IN COLORADO AND NEW MEXICO.

By C. H. Diebold; Jour. Soil and Water Conservation, Vol. 6, No. 4, pp. 202-209. October 1951.

A portable infiltrometer was used to simulate a

storm of two inches in one hour on hardland wheat soils possessing medium textured surface soils. Owing to instability of the surface soil there is a serious runoff problem on slopes of less than two percent. More than twice as much runoff was measured from crusted soils as from good blue grama-buffalo grass sod. Tillage pans, occurring at depths of from three to eight inches, are also a serious cause of runoff. Chiseling these tillage pans when dry reduced runoff appreciably from both initial storms and those made the following day. In contrast, chiseling tillage pans when nearly at field capacity reduced runoff during the initial storm because a new tillage pan was created.

SOIL REHABILITATION UNDER EASTERN RED CEDAR AND LOBLOLLY PINE.

By W. M. Broadfoot; Jour. Forestry; Vol. 49, No. 11, pp. 780-781. November 1951.

Loblolly produces considerable litter in short periods of time, and the surface 2-inch layer of soil under loblolly stands absorbs water faster than the soil under adjacent herbaceous cover. Loblolly is therefore an excellent species for flood-control planting. However, the data strongly suggest that surface soil beneath red cedar develops more desirable characteristics than surface soil beneath loblolly pine or native herbaceous cover. The use of red cedar should be seriously considered in planting programs where the objective is soil rehabilitation as well as flood control.

EXTENSION OF THE RANGE FRONT TO THE SOUTH.

By Robert C. Campbell; Jour. Forestry, Vol. 49, No. 11, pp. 787-789. November 1951.

Many case examples show that beef production can be doubled, tripled, or quadrupled with improved management. As forestry brings in more trees, there will be less range grass available in the future. But with good range and livestock management, and adequate yearlong nutrition from the combination of ranges, summer and winter pastures, and supplemental fields, the south should make rapid studies in providing good meat for its own table.

A LONGLEAF PINE THINING STUDY.

By Edward M. Gaines; Jour. Forestry, Vol. 49, No. 11, pp. 790-792. November 1951.

Dense stands of longleaf pine were thinned very heavily at age 22 years. Residual stands on thinned plots ranged from 160 to 380 trees per

acre and from 890 to 2,800 on check plots.

In the 15 years after treatment, thinned plots made slightly better diameter growth, but poorer basal area and cordwood volume growth, than moderately dense unthinned check plots (averaging about 1,200 trees per acre). Thinned plots grew much faster in diameter and basal area, and about as fast in volume, as very dense unthinned plots (about 2,300 trees per acre).

Results suggest that 15-year growth might be near maximum for both basal area and cordwood volume, and that diameter growth will be satisfactory if 22-year stands are left with about 500-900 trees per acre.

LODGING, LEAF COMPOSITION, AND YIELD OF CORN AS INFLUENCED BY HEAVY APPLICATIONS OF NITROGEN AND POTASH.

By B. A. Krantz and W. V. Chandler; Agron. Jour., Vol. 43, No. 11, pp. 547-552. November 1951.

The effects of heavy rates of fertilization on lodging, leaf composition, and yield of corn were studied in field experiments on six soil types of widely varying fertility levels. Lodging was decreased and yields increased by an application of 80 pounds potash on potash deficient soils, except on Bladen silt loam where 120 pounds were required. However, additional increments of potash had no effect on yield or lodging. Nitrogen markedly increased yield, but contrary to popular opinion, it had only a slight tendency to increase lodging. In three experiments, the mean increase in percent lodging was only 6.1, while the yield increase from nitrogen application was 58.4 bushels per acre.

Lodging increased with increasing plant population and there was a considerable difference in the lodging tendencies of corn varieties. It appears that the greatest hope for a solution of the lodging problem lies in the realm of breeding for lodging resistance and the use of proper stands with adequate fertilization.

THE USE OF THE TRENCH-WASH AND SOIL-ELUTION METHODS FOR STUDYING ALFALFA ROOTS.

By R. P. Upchurch; Agron. Jour., Vol. 43, No. 11, pp. 552-555. November 1951.

A description of the soil-elution method for extricating roots from soil is given. The principal features of this method are that 6-inch layers of soil containing roots are placed in 33-gallon drums and the soil is floated in aqueous suspension through a 16-mesh screen near the top of the drum leaving the roots behind. This method is believed to be superior to similar

"wash-by-layer" method in which some roots are lost by being forced through the screen. It is compared with the trench-wash method using duplicate excavations of alfalfa on three soil types.

ABSORPTION OF MINERAL ELEMENTS BY FORAGE PLANTS: III. THE RELATION OF STAGE OF GROWTH TO MICRONUTRIENT ELEMENT CONTENT OF TIMOTHY AND SOME LEGUMES.

By Kenneth C. Beeson and H. A. MacDonald; Agron. Jour., Vol. 43, No. 12, pp. 589-593. December 1951.

The purpose of this study was to determine the relative amounts of cobalt, copper, manganese, and iron in grasses and legumes with respect to stage of growth and season. Determinations were made at four stages of growth of alfalfa, birds-foot trefoil, ladino clover, and timothy to determine amount of the above elements in them. The results are reported.

LIMITATIONS IN THE USE OF ELECTRICAL RESISTANCE SOIL MOISTURE UNITS.

By H. A. Weaver and V. C. Jamison; Agron. Jour., Vol. 43, No. 12, pp. 602-605. December 1951.

This study was designed to test the reproductivity of fabric units for moisture-tension measurements under controlled conditions, to determine the effect of varying electrolyte concentration on their resistance, and to note mechanical features which might limit or extend their usefulness. The tests were performed on commercial samples of the nylon and fiberglas units.

PROPERTIES OF SOIL WHICH INFLUENCE WIND EROSION: V. MECHANICAL STABILITY OF STRUCTURE.

By W. S. Chepil; Soil Sci., Vol. 72, No. 6, pp. 465-478. December 1951.

To maintain stability against erosion by wind, the soil, it is believed, must possess a resistance to at least three commonly occurring and well-recognized groups of disintegrating agencies. There are (a) mechanical agents, such as tillage machinery, (b) the abrasive action of wind-borne soil material, and (c) the forces of water. This paper deals with results of a study of the possible effects of the first two of these agencies on erodibility. One of the purposes of the investigation was to determine whether stability of a soil against any one of these agencies insures stability against the others. The second purpose was to find why some soils exhibit a higher mechanical stability than

others and how mechanical stability affects erodibility by wind.

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IRRIGATION REQUIREMENTS OF CROPS.

By Harry F. Blaney; Agr.Eng., Vol. 32, No. 12, pp. 665-668. December 1951.

This paper discusses the methods used in determining the water requirements by plants.

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DRAINAGE OF IRRIGATED LANDS IN THE LOWER RIO GRANDE VALLEY OF TEXAS.

By Morris E. Bloodworth and P. Earl Ross; Agr. Eng., Vol. 32, No. 12, pp. 669-671, and 673. December 1951.

The purpose of this study was to determine the nature and magnitude and the most effective and economical methods of reducing or eliminating the drainage problem on irrigated lands in the Lower Rio Grande Valley.

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CATION EXCHANGE IN SOILS: I. AMMONIUM FIXATION AND ITS RELATION TO POTASSIUM FIXATION AND TO DETERMINATION OF AMMONIUM EXCHANGE CAPACITY.

By Isaac Barshad; Soil Sci., Vol. 72, No. 5, pp. 361-371. November 1951.

Base-exchange studies showed that a wide variety of soils have the ability to "fix" alike NH_4^+ and K^+ . A larger part of the NH_4^+ and K^+ fixation was found to reside in the coarser fraction of the soils associated with vermiculite-like minerals. In replacing adsorbed NH_4^+ from a soil, it was found that distilling with a base was more effective than leaching with a salt solution. The differences in the replaceability of adsorbed cations is explained as resulting from their accessibility to the replacing cations, which in turn depends upon the expansible nature of the interlayered crystal lattice space.

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IRRIGATION OF SOILS AND SOIL COLLOIDS: II. POTASSIUM-CALCIUM RELATIONSHIPS IN MONTMORILLONITE GROUP CLAYS AND IN ATTAPULGITE.

By S.A. Barber and C. E. Marshall; Soil Sci., Vol. 72, No. 5, pp. 373-385. November 1951.

The work of McLean and Marshall on potassium-calcium relationships in Wyoming bentonite is discussed, and a brief account of the general electro-chemistry of montmorillonite clays is given. Calcium-potassium relationships are

examined in detail for Putnum clay, Arizona bentonite, and Attapulgit, a fibrous clay. It is shown how calcium and potassium mutually affect each other through the bonding energy relationships of the ionizing surfaces.

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PROPERTIES OF SOIL WHICH INFLUENCE WIND EROSION: IV. STATE OF DRY AGGREGATE STRUCTURE.

By W. S. Chepil; Soil Sci., Vol. 72, No. 5, pp. 387-401. November 1951.

The relationships between the various dry structural conditions of the soil and erodibility by wind are described and evaluated. These relationships fall into four main categories; (a) relation of wind velocity to proportion of erodible and nonerodible fractions; (b) influence of volume of nonerodible fractions on erodibility; (c) relationship of wind velocity to erodibility; (d) influence of equivalent diameter distribution of erodible fractions on erodibility.

Tables and graphs evaluating each of these relationships give a general insight into what constitutes an erodible or a nonerodible soil. The relative erodibility of any soil of which the dry aggregate structure is known can be estimated from the table and graphs. In addition, two simplified methods of estimations are presented.

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THE IMPORTANCE OF NITROGEN AND WATER IN REDUCING COMPETITION BETWEEN INTERCROPS AND CORN.

By Touby Kurtz, S. W. Melsted, and Roger H. Bray; Agron. Jour., Vol. 44, No. 1, pp. 13-17. January 1952.

The sorption characteristics of nutrient ions in soils indicate that, under ordinary field conditions, competition between corn and an intercrop is essentially competition for nitrogen and water. This paper reports experiments in which corn was planted in slits in previously established sods of grasses and legumes. Without nitrogen fertilizer, all legumes and grasses competed severely with the corn, and low corn yields were obtained. With nitrogen and water, high corn yields were obtained in heavy growths of the intercrops. A sufficiency of nitrogen and water, however, did not completely eliminate competition between the corn and the intercrops, and corn yields under the conventional system usually exceeded those under the intercrop system by about 15 percent.

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LONG-TIME EFFECT OF APPLYING BARNYARD MANURE AT VARIED RATES ON CROP YIELD AND SOME CHEMICAL CONSTITUENTS OF THE SOIL.

By B. L. Brage, M. J. Thompson, and A. C. Caldwell; Agron. Jour., Vol. 44, No. 1, pp. 17-20. January 1952.

This paper deals with crop yield and chemical constitution of a soil as influenced by application of manure at different rates over a 30-year period. Yields were substantially increased by manure. Each additional increase in manure brought about a corresponding increase in yield. Hay yields were better when manure was applied to stubble. Cultivated and grain crops yielded best when manure was applied to sod. A 20-ton application of manure increased the content of organic carbon and nitrogen in the soil by a considerable amount. A 10- and 5-ton application brought about considerably smaller increases.

JUST WHAT IS CONSERVATION?

By Emanuel Fritz; Jour. Forestry, Vol. 50, No. 1, pp. 3-5. January 1952.

The author argues that conservation, to be meaningful must be looked upon as wise use, frugality, and use without waste, and that it starts with the individual's wise use of his own resources - time, effort, and money. He believes that conservation is too frequently preached by those who are not qualified by its basic principles in their own affairs and in the handling of public monies. He pleads for conservation teaching at its roots - frugality - to develop a race of citizens to whom all waste is abhorrent and from whom a more frugal corps of public servants can be enlisted.

ROOT MORTALITY OF SHORTLEAF AND LOBLOLLY PINE IN RELATION TO SOILS AND LITTLE LEAF DISEASE.

By Otis L. Copeland, Jr.; Jour. Forestry, Vol. 50, No. 1, pp. 21-25. January 1952.

The purpose of this study was to determine the size, condition, and distribution of shortleaf and loblolly pine roots in relation to soil properties in the top 12 inches of five soil series for five age and condition classes of trees. The percentage of dead roots by age and condition classes of trees were as follows: Young healthy loblolly 3.7, young healthy shortleaf 2.9, older healthy loblolly 6.3, older healthy shortleaf 18.0, and older little leaf shortleaf 34.4.

There appears to be a critical percentage of dead roots somewhere between 18 and 34 percent beyond which a tree cannot continue normal growth and begins to decline.

SNOW ACCUMULATION AND RETENTION ON PONDOROSA PINE LANDS IN IDAHO.

By H.F. Haupt; Jour. Forestry, Vol. 44, No. 12, pp. 869-871. December 1951.

The effects of aspect and plant cover conditions on snow accumulation and retention observed in this study are in general agreement with results of other comparable studies and observations. They support the commonly held idea that the best opportunity for maximum snow storage and retention in old growth pondorosa pine forest exists on north slopes. On such aspects it appears that the greatest storage and retention effects can be obtained by creating large openings in the forest stand. Numerous small openings and a high percentage of sapling stand area would be almost as effective. It is also apparent that large openings should be avoided on the summer aspects. Here, management practices that favor sapling stands and numerous small openings that are shaded by surrounding trees appear to be most desirable.

AN OBJECTIVE LOOK AT THE VEGETATION-STREAM FLOW RELATIONSHIP.

By Richard S. Sartz; Jour. Forestry, Vol. 49, No. 12, pp. 871-875. December 1951.

This paper suggests the quantitative effects of vegetation on stream discharge vary widely, depending on how many of the separate factors are acting, and on the extent to which they are affected by the controlling variables. Under some conditions adjustments of the cover do not greatly affect the volume of stream flow, but under others pronounced changes result. To do so, the watershed manager must have an intimate knowledge of those factors of vegetation, precipitation, and soils that affect their inter-relationship in his area.

EVALUATION OF AIR RESISTANCE TO FREELY FALLING DROPS OF WATER.

By Robert L. Green; Agr. Eng., Vol. 33, No. 1, p. 28. January 1952.

For stable drops there is no true terminal velocity but a mean terminal velocity that is approached only as the horizontal drop axis approaches a maximum and is exceeded when the oblation is a minimum.

A BASIC CONCEPT OF EQUILIBRIUM MOISTURE.

By S. M. Henderson; Agr. Eng., Vol. 33, No. 1, pp. 29-32. January 1932.

An empirical equation, found to represent conventional equilibrium moisture data was established rigorously by a thermodynamic procedure. The equation makes possible (a) to extrapolate limited data to other relative humidities and moisture content, (b) to determine the temperature effect upon the relative values, (c) to provide a complete curve with fewer observations, two being the minimum, and (d) to report or record equilibrium moisture data.

RESEARCH POINTS THE WAY TO HIGHER LEVELS OF PEANUT PRODUCTION.

By E. T. York, Jr.; Better Crops with Plant Food, Vol. 36, No. 1, pp. 6-12 and 47. January 1952.

Intensive research programs are providing the answers to many questions regarding the supposedly mysterious peanut crop. With the proper application of this information, peanut yields should be markedly increased. For example, yields of 4,800 pounds per acre - four times the State average - have been obtained in experiments in North Carolina through the use of a combination of improved practices. With performances such as this the lowly "goober" should soon rid itself of the stigma of peculiarity and further assert itself as the King of the Oil Crops.

SIMPLE TESTS FOR MAGNESIUM AND CALCIUM IN PLANT MATERIAL AND MAGNESIUM IN SOILS.

By Kuang Lu Cheng and Roger H. Bray; Better Crops with Plant Food, Vol. 36, No. 1, pp. 13-14, 39-40. January 1952.

This paper describes direct spot test techniques for magnesium in soils and for magnesium and calcium in plant materials which may prove helpful in diagnosing calcium and magnesium deficiencies. So far they are only tests, not calibrated tests, although the magnesium test is partially calibrated.

LADINO CLOVER - ITS MINERAL REQUIREMENTS AND CHEMICAL COMPOSITION.

By Ivan Stewart and Firman E. Bear; N. J. Agr. Expt. Sta. Bul. 759. October 1951.

This bulletin discusses the mineral requirements and the chemical composition of Ladino clover.

RANGE PROBLEMS OF MARGINAL FARM LANDS.

By Mont H. Saunderson; Jour. Range Mgt., Vol. 5, No. 1, pp. 13-15. January 1952.

This article discusses the range problems of marginal farm lands in the Northern Great Plains. The region includes the east half of Montana; the parts of North and South Dakota west of the 98th meridian; northeast Wyoming and northwest Nebraska. The principles, however, will apply to other regions.

TIMBER MILK VETCH POISONING ON BRITISH COLUMBIA RANGES.

By M. A. MacDonald; Jour. Range Mgt., Vol. 5, No. 1, pp. 16-21. January 1952.

Astragalus Serotinus Gray, commonly called timber milk vetch, is a poisonous plant which is indigenous to British Columbia. It causes losses in cattle, sheep, and horses; lactating females being more susceptible than dry females and males. Timber milk vetch is abundant throughout the upper grassland and mountain forest zones of British Columbia. Instances of poisoning are evident from the end of May until late August although most cases occur in late June and July.

GROWTH CHARACTERISTICS OF BLUE GRAMA IN NORTHEASTERN COLORADO.

By G. T. Turner and G. E. Klipple; Jour. Range Mgt., Vol. 5, No. 1, pp. 22-28. January 1952.

The purpose of this study was to gain a better understanding of the manner in which blue grama responds to variations in growing conditions; to determine the effects of different periods and intensities of clipping on herbage production by blue grama; and to determine whether or not the herbage of blue grama normally declines in weight as it matures.

It was found that blue grama responds quickly to favorable and unfavorable growing conditions. That harvesting of blue grama vegetation to the root crown once during the growing season and again in October removed a greater total weight of air-dry herbage from the range than harvesting only in October. Air-dry weight of blue grama herbage reaches a maximum during the active growth period, and then declines as the plants mature.

AMERICA'S CAPACITY TO PRODUCE FOOD.

By Robt. M. Salter; Paper presented at the meeting of the National Farm Institute, Des Moines, Iowa. Multilithed. February 15, 1952.

The modern concept of soil conservation has come to mean applying the necessary practices on a farm to increase production and to build up soil productivity, both at the same time. It means making soils yield abundantly year in and year out for an indefinite period. It means building strength in the land.

The biggest point in this concept is - you can conserve soil without improving it, but you can't build soil up without conserving it. Soil is like a living thing. Feed it right and treat it right, and it grows like any living thing - and produces more while it is growing.

There is more to conservation farming than controlling erosion. It involves the prevention of soil deterioration and erosion, more productive use of the rain that falls on the land, proper drainage and irrigation, rebuilding eroded soil, building up soil fertility, and increasing yields and farm income -- all at the same time. It involves increasing production and increasing standards of farm living for today, tomorrow, and for posterity.

THIS MAY REVOLUTIONIZE THE WAY YOU GROW CORN.

By John Strohm; Country Gentleman, Vol. 122, No. 2, pp. 26-27, and 68-70. February 1952.

This paper explains how a worn-out Indiana farm, by planting corn with a mulch planter into the trash and fertilizing amply was made to produce a profit of \$103.18 per acre in 1951. The yield was 125.5 bushels per acre.

THE WATERSHED - USING IT AS A BASIS FOR SOIL AND WATER CONSERVATION - GETTING THE FACTS THROUGH SURVEYS AND INVESTIGATIONS.

By H. E. Hudson, Jr., and J. B. Stall; Jour. Soil and Water Conservation, Vol. 7, No. 1, pp. 11-15. January 1952.

Collecting basic data on soil and water resources is the starting place in project design. The watershed is a natural "water handling" unit and has important advantages as a basis for collecting and analyzing facts. Recurring measurements are necessary for most hydrologic facts. Non-recurring measurements are suitable for land facts with noted exceptions. A continuing program of study of reservoir sedimentation in Illinois has shown the effect of human activities on the transport of sediment by water. Local, State and Federal agencies must collaborate to insure well-rounded programs of data collection.

PLANNING THE WATERSHED.

By Carl B. Brown; Jour. Soil and Water Conservation, Vol. 7, No. 1, pp. 16-21. January 1952.

This paper outlines the procedure for developing plans for watershed use.

PUTTING THE WATERSHED PLAN TO WORK.

By W. L. Heard; Jour. Soil and Water Conservation, Vol. 7, No. 1, pp. 22-27. January 1952.

This paper explains how watershed plans should be put to use.

THE ECONOMICS OF IDLE RESOURCES.

By L. Gregory Hines; Jour. Soil and Water Conservation, Vol. 7, No. 1, pp. 27-29. January 1952.

National policy goals emphasizing full utilization of resources to achieve full employment and maximum output have overlooked the critical difference between human and natural resources. In the case of human resources, continuous employment is essential to achieve maximum output; in the case of renewable natural resources, periods of enforced idleness may be required to maintain long-run maximum output by the American economy. In addition, by accepting commercial profitability as the sole criterion of the economic worth of resources, socially desirable uses of idle resources are frequently overlooked. Some resources attain their greatest economic and social worth when commercial exploitation is prohibited.

WATER IN THE SOUTHEAST.

By John J. Noll; Jour. Soil and Water Conservation, Vol. 7, No. 1, pp. 30-34. January 1952.

The Southeast is blessed with an abundant supply of good quality water. In fact, the water supply of this section is one of its most important natural resources, and one that is constantly being renewed. With water shortages occurring in many places elsewhere, the huge supplies of the Southeast are still largely undeveloped. Rainfall, the source of all our water, is usually more than adequate and well distributed throughout the year.

BIG FLATS -- A STORY OF SOIL STRUCTURE.

By C. S. Slater; What's New in Crops and Soils, Vol. 4, No. 5, pp. 12-13 and 33. February 1952.

This paper explains how heavy straw mulches improved the structure of the soil on the Big Flats Nursery.

CLIMATE CALENDAR' INSTEAD.

By Jules Billard; Pathfinder, Vol. 59, No. 3, pp. 28-29. February 6, 1952.

This article describes a "climate calendar" which may be used as a basis for determining the best planting date for various crops. This calendar is based on two things. The first is the difference between climate and weather. Plants develop faster in July than in March because climatic factors, especially temperature, are more favorable. This leads to the second thing on which the calendar was built - the "growth unit," a yardstick developed for measuring a plant's growth in terms of these climatic factors.

The plant's transpiration and carbon dioxide intake are proportional to each other and directly related to climate. Under ideal conditions the greater the energy taken in from the sun, the greater will be its water-use and the more rapid its growth. Thus the amount of water needed is an index of the amount of growth and development. Each crop requires a specific number of growth units to develop from seed germination to maturity. No matter when the crop is planted, it won't reach maturity until it has received the total growth units its variety requires. On a hot summer day more growth units will accumulate than on a cool spring one. At Seabrook growth units accumulate at a rate of 10 a day toward the end of March, 30 a day in the middle of April, and hit a peak of 53 a day on July 23. Then they fall off gradually to 10 a day in November. If a crop is to be harvested on a certain date, you count back the calendar days until the total number of growth units they will supply equals the number needed to mature that specific crop.

The data have been put on a slide-rule gadget which relates the climate calendar to the everyday calendar. In half a minute anybody can set a pointer at the date he wants a crop to come in, then read opposite a second pointer the date needed to plant to get the right number of growth units.

WINTER PASTURES ARE WORTH \$\$\$.

By Dean McHard and Melvin D. Jones; What's New in Crops and Soils, Vol. 4, No. 5, pp. 17-20. February 1952.

This paper explains how winter pastures can be produced and points out some of their benefits.

HOW TO MAKE YOUR GRASSED WATERWAY.

By Marvin A. Anderson; What's New in Crops and Soils, Vol. 4, No. 5, pp. 20-21. February 1952.

This paper points out the benefits to be derived from grassed waterways and explains how they can be developed.

DEPTH AND SPACING FOR DRAIN LATERALS AS COMPUTED FROM CORE-SAMPLE PERMEABILITY MEASUREMENTS.

By Phelps Walker; Agr. Eng., Vol. 33, No. 2, pp. 71-73. February 1952.

This paper presents a method for approximating the most efficient depth and spacing of drain laterals computed from permeability measurements. Where adequate permeability measurements are available, the method seems to be satisfactory in most of soil conditions encountered in Virginia. It is designed to take into account soils composed of several layers of varying permeabilities and porosities. It is equally applicable when drains are located in different layers as long as the drains are at approximately the same elevation and equal depth.

NEW WAY TO GROW CORN.

By Frank W. Bill and Ralph D. Wennblonn; Farm Journal. February 1952.

This paper describes new ways to grow corn. One method is to plant corn in rows 80 inches apart and plant clover between the rows for vegetal cover. Another method is to plant corn in thick stands of clovers and grasses. A mulch planter works up narrow slits in the sod, and plants the corn in rows 40 inches apart. Corn planted the latter method made 125.5 bushels per acre in Indiana in 1951.

LOSS OF NITROGEN AND WATER FROM FAYETTE SILT LOAM AS MEASURED BY MONOLITH LYSIMETERS.

By Clyde E. Bray and Harold H. Hull; Agron. Jour. Vol. 44, No. 2, pp. 78-82. February 1952.

Percolation and nitrogen losses in relation to rainfall, tillage, and manure treatments were investigated with lysimeters located on Fayette silt loam. Water losses in runoff and percolation were low in a dry year and in the year of near normal precipitation which followed. Losses were high in a wet year and also in the following year of normal precipitation. Subsurface tillage where clover-timothy residue was left on or mixed

DON'T PLANT IN THE DARK OF THE MOON: USE THE

with the surface soil reduced runoff 1.98 inches and increased percolate 1.16 inches as compared with clover-timothy plowed under.

The surface application of barnyard manure decreased runoff by 0.66 inch and increased percolate by 0.56 inch. Retention of green manure on the surface results in a reduction in the loss of nitrogen by leaching from 13.6 to 5.1 pounds per acre even though percolate was increased 1.16 inches. The surface application of barnyard manure decreased nitrogen loss in the percolate by 3.2 pounds per acre as compared with no barnyard manure treatment. Mulch on the soil surface reduced runoff, increased percolation, and reduced loss of nitrogen in percolate regardless of whether the mulch consisted of legume-grass residue or strawy barnyard manure.

THE CONSERVATION OF SOIL MOISTURE IN SOUTHERN SASKATCHEWAN.

By W. J. Staple and J. J. Lehane; Sci. Agr., Vol. 32, No. 1, pp. 36-47. January 1952.

Seven years' measurement of moisture conservation are presented. A mean precipitation of 18.7 inches received during a 21-month period was made up as follows: August to October, 2.2 inches; November to April, 4.3 inches; May to October 7.8 inches and November to April 4.4 inches. The average moisture conserved in stubble fields at seeding time was 2.2 inches and in summer fallow 4.0 inches. The mean conservation for the first 9 months was 33 percent of the precipitation, for the last 12 months it was 14 percent, and for the whole period, it was 21 percent. The winter precipitation which was largely snowfall was consistently beneficial in stubble fields. It provided two-thirds of the moisture stored in stubble at seed-time.

MEDICINE CREEK WATERSHED INVESTIGATIONS STATUS REPORT NO. 1.

SCS, Bur. of Reclamation, Geol. Survey Univ. of Nebraska. November 1951.

It is the purpose of this progress report to summarize the objectives and status of current studies in the Medicine Creek Watershed in south central Nebraska to outline plans for their continuation; and to present recommendations for certain additional investigations which seem, at present, to be required to assure the collection of adequate data.

GASEOUS DIFFUSION ON POROSITY IN POROUS MEDIA.

By C. H. M. Van Bavel; Soil Sci., Vol. 73, No. 2,

pp. 91-104. February 1952.

This paper reports the results of the reexamination of the relationship between the rate at which gases diffuse through soil and its porosity. Utilization of a precise experimental technique and analysis of the data with the result of an exhaustive theoretical treatment are believed to give a satisfactory degree of reliability to these results.

A NUMERICAL METHOD FOR SOLVING THE FLOW EQUATION FOR WATER IN UNSATURATED MATERIALS.

By Arnold Klute; Soil Sci., Vol. 73, No. 2, pp. 105-116. February 1952.

An equation describing the flow of water in unsaturated porous materials was derived from Darcy's Law, and the equation of continuity. A numerical method of solution of this equation for semi-infinite horizontal systems of flow was described and applied to several examples. The phenomenon of a wetting front was shown to be indicated when the variation of the diffusivity with moisture content was considered.

PHYTASE ACTIVITY IN SOILS.

By R. H. Jackman and C. A. Black; Soil Sci., Vol. 73, No. 2, pp. 117-125. February 1952.

It was found that soils contain phytase. When the native phytase was destroyed by steam-sterilization, phytase reappeared in the soil when a mixed culture of microorganisms or pure cultures of fungi or bacteria were allowed to develop. When the magnitude of a mixed population of microorganisms was varied by the supply of organic material added to the soil, the phytase activity developed, was proportional to the amount of CO_2 evolved. Apparently, the occurrence of phytase increases with the metabolic activity of the microbial population.

RESPONSE OF CROP PLANTS TO I AND BR.

By Harvey P. Newton and Stephen J. Toth; Soil Sci., Vol. 73, No. 2, pp. 127-134. February 1952.

The purposes of this study were to determine whether tomatoes would respond to I and Br applications to the soil on which they were being grown; to determine the residual effects of such I applications, using buckwheat as a test crop; and to investigate I-Cl and I-Br relationships in plants.

THE ASPERGILLUS NIGER METHOD FOR DETERMINING COPPER IN SOILS.

By Marjorie Welsh Dole; Soil Sci., Vol. 73, No. 2, pp. 135-147. February 1952.

The purpose of this study was to confirm and extend the bioassay method as it has been employed by others, and to evaluate its use for various United States soil types. As the work progressed, various modifications in the techniques described by others were adapted for convenience and efficiency. The final section of this paper is devoted to recommended procedures.

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EFFECT OF FUMIGATION ON SOME CHEMICAL PROPERTIES OF SOILS.

By D.G. Aldrich and J. P. Martin; Soil Sci., Vol. 73, No. 2, pp. 149-159. February 1952.

The purpose of this study was to determine the nature of the chemical changes produced by partial sterilization of soil with volatile fumigants and with steam. Treatment with steam, chloropicrin, "D-D", CS₂, propylene oxide, and ethylene dibromide produced an initial increase in the ammonia nitrogen in the soil, which upon incubation appeared to be influenced by the nature of the soil and the sterilizing agent.

Fumigation with "D-D", chloropicrin, and CS₂, and steam sterilization produced substantial changes in the amounts of Ca, Mg, K, and Mn in extracts of the treated soils. Propylene oxide and ethylene dibromide produced only a small change in the solubility of these cations.

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TEAMWORK ON THE LAND.

By Robt. M. Salter; Paper presented at the state meeting of FMA Committeemen, SCS personnel, and soil conservation district supervisors, Nashville Tenn., March 6, 1952. Multilithed.

There are too many farms where erosion is still exacting a heavy toll from our soil resources. On even more farms, soil productivity is still on the down grade. Much of the humus has been lost and fertility has been lowered. That is still going on.

For the first 70 years of crop production in the country the average crop yield per-acre changed but little. During the past 15 years there has been a sharp upswing. The trend in yields changed about 1937. Since then the average per-acre yields have gone up about 40 percent.

There were technological improvements in farming before 1937, so there were other conditions which were offsetting the effect of those improve-

ments. One of the most important conditions which canceled the effect of improved methods and techniques was declining soil productivity and losses from erosion. We made advances in farming but we also slipped back because of soil deterioration.

Studies indicate that with the best combination of known practices put into use on all farms, production in the United States can be increased from 60 to 75 percent. The modern concept of conservation farming means applying the necessary measures to a farm to increase production and build up soil productivity, both at the same time. You cannot build up productivity without conserving soil. Soil conservation means making soils yield abundantly year in and year out for an indefinite period.

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EFFECT OF WELL SCREENS ON FLOW INTO WELLS.

By Jack S. Petersen, Carl Rohwer, and M. L. Albertson; Colo. Agr. Expt. Sta. Prog. Rpt. on the Performance of Well Screens. January 22, 1952.

The hydraulics of wells involves the flow in the surrounding aquifer, through the well screen, and inside the well. A theoretical development is presented which relates the head loss involved to the characteristics of the well screen. To support the theoretical development, a laboratory investigation of idealized well screens was made. Application of the theory to commercial well screens is included.

The objective of the investigation was to establish criteria which could be used to aid in the selection of well screens to meet the varied conditions found in different areas of the country. To do this, screen coefficients were determined for specific well screens which would permit the use of a theoretical equation for design purposes.

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COOPERATIVE SURFACE AND SPRINKLER IRRIGATION INVESTIGATIONS, BLACK CANYON PROJECT - PROGRESS REPORT FOR 1951.

By Claude Pair and Sterling Davis: Idaho Agr. Expt. Sta. Mimeo. December 1951.

This report is a summary of the work done on sprinkler and surface irrigation investigations during the 1951 season, together with the results obtained. Certain trends are noted and some conclusions have been drawn from the data gathered.

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SUPPLEMENTAL IRRIGATION IN MICHIGAN.

By E. H. Kidder and Paul E. Schleusener; Mich. Ext. Service, Ext. Bul. 309. February 1952.

Supplemental irrigation is the use of irrigating systems in areas where the average monthly rainfall is usually considered sufficient for profitable farming. It is the artificial watering of fields, during periods of minor or major drought only, to furnish the moisture needed for good crop production.

It helps carry crops over the dry periods which can occur even in a normal growing season, by preventing any serious retarding of growth or premature ripening. In years when the rainfall is less than normal, or poorly distributed, it is of particular value for the high-return, shallow-rooted crops grown on light soils.

Most likely it will not be needed every year. There will be years of higher-than-normal rainfall when little or no gain can be expected from supplemental irrigation. At the same time, it is also possible to put too much water on certain crops and soils, causing a decrease in yield.

ANNUAL PROGRESS REPORT, SOIL CONSERVATION SERVICE RESEARCH, AMES, IOWA, 1951.

By F. W. Schaller; Iowa Agr. Expt. Sta. Ditto. March 1952.

This is a brief summary of the main accomplishments to date.

THE JOB AHEAD.

By Robt. M. Salter; A talk presented at the 6th annual meeting of the National Assoc. of Soil Conservation Districts at Cleveland, Ohio, on February 28, 1952.

The concept of soil conservation has come to mean proper land use, protecting the land against all forms of soil deterioration, rebuilding eroded soil, conserving moisture for crop use, proper agricultural drainage and irrigation where needed, building up soil fertility, and increasing yields and farm income -- all at the same time.

It is based on the understanding that you can conserve soil without building it, but you cannot build soil without conserving it.

Modern conservation farming involves increasing soil productivity and increasing standards of farm living for today, tomorrow, and for posterity. It combines the objective of national welfare with better living for the people who work the land. It has come to mean efficient abundant production on a sustained basis.

PLANT AND SOIL AND WATER RELATIONS ON THE WATERSHED.

By Paul J. Kramer; Jour. of Forestry, Vol. 50, No. 2, pp. 92-95. February 1952.

Trees and other vegetation affect soil moisture indirectly by modifying interception, evaporation, and the soil conditions controlling infiltration; but the most important effect is direct removal of water by transpiring plants. Transpiring vegetation removes water in the range from field capacity to permanent wilting.

Rates of water absorption and transpiration decrease toward the permanent wilting percentage, and highest water losses occur from vegetation growing in soil with a moisture content near field capacity.

EFFECT OF FARM WOODLAND GRAZING ON WATERSHED VALUES IN THE SOUTHERN APPALACHIAN MOUNTAINS.

By E. A. Johnson; Jour. of Forestry, Vol. 50, No. 2, pp. 109-113. February 1952.

This paper discusses the effects of grazing woodland on timber, vegetation, soil, and water.

THE MEASUREMENT OF SOIL AND WATER LOSSES WITH RUNOFF PLOTS.

By J. R. Carreker and B. H. Hendrickson; USDA, SCS. February 1952.

This is a brief discussion of the usefulness of runoff plots for securing essential basic data of soil and water conservation, together with a short description of a typical runoff-plot installation at the Southern Piedmont Conservation Experiment Station, Watkinsville, Ga.

A RECORD OF RESEARCH: I.
The Institute of Statistics, University of North Carolina. July 1, 1948 to June 30, 1951.

This report presents a brief account of the research program of the Institute of Statistics for the period from July 1, 1948, to June 30, 1951. Since the work of the earlier period was described in detail in another brochure published in 1948, only a brief general recapitulation of that period is given here.

ANNUAL PROGRESS REPORT OF EXPERIMENTAL WORK.
Iowa Agr. Expt. Sta. Mimeo. FSR-50. February 1952.

This is a brief report of the findings at the Luton experimental field and related areas for 1951.

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ANNUAL REPORT FOR 1951.

By D. D. Smith and D. M. Whitt; Mo. Agr. Expt. Sta. Mimeo. Report. 1952.

This is a brief summary of the results obtained at the Midwest Claypan Soil Conservation Experiment Farm, McCredie, Missouri, during 1951.

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HANDBOOK OF OHIO EXPERIMENTS IN AGRONOMY.

Ohio Agr. Expt. Sta., Book Series B-10. November 1951.

This is a condensed summary of the agronomic research conducted at the Ohio Agr. Expt. Sta. during the past several years. It is divided into eight sections as follows: liming and soil reaction, fertilizers and manures, corn and soybeans, small grain, meadows and pastures, crop residues and green manures, rotation of crops, and soil and water conservation.

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RAINDROPS AND SOIL EROSION.

By Yoshiaki Mihara; National Inst. of Agr. Sci., Ser. A, pp. 1-59. Tokyo, Japan. July 1951.

This reports a study dealing with the effect of raindrops on soil erosion. Twenty-five rains in 1947 and 1948, mainly during the summer months, serve as the basis of this study. It is shown that the impact of raindrops is an important factor in the process of sheet erosion. In fact, the author concludes that raindrop splash is the main cause of sheet erosion and without it there would be little erosion. Rain is treated as a group of particles that have the ability to work. The amount of work done against the ground surface by raindrops is proportional to the kinetic energy of the drops. The report consists of two parts. The first part deals with the action of raindrops. The second describes the damage by the falling raindrops.

It was concluded that a raindrop about 5 mm. in diameter has a maximum terminal velocity of 9 meters per second. There are more of the smallest raindrops (0.2 to 0.3 mm.) during an ordinary rain. As the radius of the drops increases, the number of drops decreases very rapidly. The maximum radius was 3.0 mm. As the rainfall increases in intensity, the number of both large and small drops increases, but the rate of increase is much greater with the latter. Even though the number of smaller-size drops is much

greater than the larger ones during heavy rains, the larger drops are more important in the erosion process.

The kinetic energy of raindrops amounts to 10^4 ergs for drops of 2 mm. radius. The kinetic energy contained in a drop 2.5 mm. radius is sufficient to raise by 1 cm. a body weighing 46 grams. During an ordinary rain, the energy contained in the raindrops falling on each square cm. is equal to about 10^5 ergs. As the intensity of rainfall increases, the kinetic energy increases at the rate of 1.2 powers the intensity. The amount of damage done by falling raindrops is proportional to the kinetic energy of the drops. The force of falling raindrops at the point of impact may be 10,000 times that of the surface runoff.

Splash from falling raindrops striking bare ground may rise to a height of 70 cm. and may extend a distance of 150 cm. radius. These splashes carry particles of soil with them. About one-third of the momentum of the falling drop is expended in generating splashes. The remainder is used in compressing the soil surface while at the same time pushing the soil aside. The main effect of vegetal covers in preventing erosion is by intercepting the falling raindrops. Small undulations caused by falling raindrops striking bare soil lead to the formation of rills.

The maximum infiltration per unit area does not vary with slope nor with the duration of rainfall impact. When falling raindrops strike the ground surface the infiltration rate decreases rapidly until it attains a constant final infiltration ratio. This decline in infiltration rate decreases more rapidly and the final infiltration ratio becomes smaller with an increase in the size of the raindrops, even though there may be no increase in rainfall intensity. The decline in the infiltration rate is more rapid and the final infiltration ratio becomes smaller as the slope decreases, even with no change in rainfall intensity.

Both the amount and the force of rainfall above a certain critical intensity must be considered in determining erosion hazards. It is meaningless to use total rainfall values for this purpose.

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HUMUS FROM PLASTIC PROMISES BIGGER CROPS, GREENER LAWNS.

By Hartley E. Howe; Popular Sci. Monthly, pp. 106-109, and 270-272. March 1952.

Krilium is a synthetic humus made from acrylonitrile, a plastic. When scattered over the ground, krilium forms a water permeable film over the surface of bare-slopes that lets water

through but hangs onto the topsoil and it stays there until the grass comes through to form a cover. Krilium also holds seed in place, preventing its washing out. It does not provide any food for plants; but improves the structure of poor soil.

Krilium does the same job on soil structure as natural humus, and being a synthetic resin, it is resistant to bacteria. As organic matter decomposes it leaves certain gums in the soil. These gums, related chemically to starch, are called polyuronides. They act as a kind of natural cement, gluing the soil particles together into aggregates.

Krilium is a polymer, a substance made up of a chain of long molecules. When it is dissolved by water, these long molecules become ionized -- negatively charged. Their ends tend to become firmly fixed to the soil particles by an exchange of negatively charged atoms.

This is what keeps krilium from washing away. Locked to the dirt particles, the krilium molecules act like bridges between them, keeping them from separating yet at the same time holding them at arm's length so they won't pack down tight.

PLANT STUDIES WITH RADIOACTIVE CALCIUM.

By David Ririe and Stephen J. Toth; Soil Sci., Vol. 73, No. 1, pp. 1-10. January 1952.

This study deals with the relative availability to plants of Ca in the carbonate, phosphate, and sulfate forms, as applied to soil for correction of acidity and for fertilizing purposes. It also has to do with the translocation and distribution of Ca in various plants without reference to its source.

INFLUENCE OF SOIL ACIDITY ON ABSORPTION OF CALCIUM BY ALFALFA AS REVEALED BY RADIOCALCIUM.

By W. R. Schmehl, Michael Peech, and Richard Bradfield; Soil Sci., Vol. 73, No. 1, pp. 11-21. January 1952.

Greenhouse experiments were conducted to study the influence of soil acidity and its associated factors on the absorption of calcium by alfalfa. Radiocalcium was used to label the CaCO_3 applied to the soil and the calcium supplied in nutrient solutions.

It was concluded that the low calcium content usually observed in plants grown on acid soils may be due to the antagonistic effect of Al^{+++} , Mn^{++} and H^+ on the absorption of Ca^{++} as well as to the restricted root growth rather than to the low calcium supply in the soil.

MOVEMENT AND EFFECT OF LIME AND GYPSUM IN SOIL.

By David Ririe, Stephen J. Toth, and Fireman E. Bear; Soil Sci., Vol. 73, No. 1, pp. 23-35. January 1952.

The purpose of this study was to determine the rate of movement of six liming materials and of gypsum and their effect on the soil when they were incorporated into the surface layers of two New Jersey soils, in a lysimeter type of test. A second test, involving the use of three Ca^{45} - tagged liming materials, was also performed to obtain supplementary information on rate of movement.

EFFECT OF PARTICLE SIZE OF LIMESTONES ON SOIL REACTION, EXCHANGEABLE CATIONS, AND PLANT GROWTH.

By T. A. Meyer and Garth W. Volk; Soil Sci., Vol. 73, No. 1, pp. 37-52. January 1952.

This work considers in detail the influence of particle sizes, rate of application, and time after application of liming materials upon reaction (pH) and exchangeable-cation changes in the soil and the effect of these changes on growth and chemical composition of alfalfa and soybeans.

A METHOD OF ESTIMATING THE REACTING RATE OF DIFFERENT PARTICLE SIZES OF LIMESTONE.

By R. P. Thomas and H. M. Gross; Soil Sci., Vol. 73, No. 1, pp. 53-59. January 1952.

This paper reports a study of the many methods proposed to evaluate different sizes of lime materials and makes suggestions as to how these methods may be improved.

INFLUENCE OF LIMING MATERIALS ON pH VALUES OF SIX MARYLAND SOILS.

By J. H. Hoyert and J. H. Axley; Soil Sci., Vol. 73, No. 1, pp. 61-69. January 1952.

The influence of various liming materials on pH values was studied on six important Maryland soils. These soils were in prominent agricultural areas throughout the State and represent diversified conditions. Five different liming materials - medium I limestone, medium II limestone, fine limestone, burnt lime, and hydrated lime - at two weight levels were included in the study. The effect of time on the pH values of limed soils was also studied over a 3-year period.

INFLUENCE OF PLACEMENT OF LIME COMPOUNDS ON ROOT DEVELOPMENT AND SOIL CHARACTERISTICS.

By D. Longenecker and F. G. Merkle; Soil Sci., Vol. 73, No. 1, pp. 71-74. January 1952.

These experiments lend strong support to the belief that the chief function of liming is to decrease the solubility of aluminum and manganese and possibly to increase the availability of phosphate. They support the belief that neutralization of soil acidity takes place close to the dissolving particles and that calcium does not diffuse rapidly from place to place in soils held at optimum moisture content. They also support the concept that for reasonably rapid results lime compounds should be thoroughly mixed mechanically into the entire soil zone in which roots are expected to develop.

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INFLUENCE OF FORM, FINENESS, AND AMOUNT OF LIMESTONE ON PLANT DEVELOPMENT AND CERTAIN SOIL CHARACTERISTICS.

By R. L. Beacher, D. Longenecker, and F. G. Merkle; Soil Sci., Vol. 73, No. 1, pp. 75-82. January 1952.

This study was aimed at determining if coarse lime materials became effective in future seasons and if the use of large amounts of coarse material is feasible and, if so, how much would be needed to equal the fine product in effectiveness.

Calcitic and dolomitic hydrates used in chemically equivalent amounts were equally effective in raising pH values, lowering replaceable H, Al, and Mn, and promoting growth of crimson clover.

Calcitic and dolomitic limestones 100-mesh and finer are virtually equal to the corresponding hydrates in increasing yields and in raising pH values and lowering the replaceable H, Al, and Mn.

Coarse dolomitic limestone is less effective in promoting germination and the growth of tops and roots of crimson clover than calcitic stone of equal size.

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AN ELECTRICAL ANALOGUE FOR THE STUDY OF DIFFUSION PROCESSES WITH INTERNAL GAINS OR LOSSES.

By C. H. M. van Bavel and A. W. Waltner; Trans. Amer. Geo. Union, Vol. 32, No. 6, pp. 885-890. December 1951.

By placing a fairly large number of electrodes in a layer of liquid and with proper boundary conditions an electrical analogue may be constructed

that is representative for diffusion of mass or energy through a medium with internal gains or losses. It is shown that the results obtained with such an electrical analogue are in agreement with the ones exacted by a theoretical treatment of such problems for diffusion in one dimension, this being applicable to gaseous diffusion in soils.

It is also shown that this method may be used to obtain information on temperature distribution in cases of heat transfer where heat is being generated or lost in the medium through which it diffuses by conduction. A specific example of such an instance has been examined and numerical values are given.

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EVALUATION OF THE CRITICAL REGIME IN STRATIFIED FLOW.

By A. Craya; Trans. Amer. Geo. Union, Vol. 32, No. 6, pp. 891-897. December 1951.

A fundamental role in the study of flow in open channels is played by the concept of the critical regime. This concept has recently been generalized by Rossby for gravity currents due to density stratification, the implications of which should provide a better understanding of the distribution of winds, oceanic currents, and flow due to density stratification in general.

The purpose of the present paper is to interpret this generalized concept from the hydraulics point of view. Consideration of the momentum principle and of the energy principle permits the formulation of two integral expressions for the cross section of a stratified current, the value of which can only decrease. These integrals nevertheless have a minimum value which is attained for a certain thickness of the current and for a certain velocity distribution, which by definition represent the critical regime. Critical regimes obtained by the two foregoing principles are not identical, though very nearly so.

Concerning the shape of the critical distribution of velocity, the following cases are distinguished: (a) For a surface current without any restriction on the displacement of the topmost layer, the velocity increases from zero at the interface to a maximum at the free surface; (b) for a surface current of which the topmost streamline is restricted to a condition like constancy of elevation, there is a maximum velocity some distance under the free surface.

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ON THE ORIGIN OF RIVER MEANDERS.

By P. Wilh. Werner; Trans. Amer. Geo. Union,

This paper deals with the origin of river meanders. It is believed that the regular pattern characteristic of meandering, and especially the more or less constant nodal distance between bends of a given river stretch, are closely connected with transverse oscillations of the stream. The study aims at correlating in a simple formula the main factors governing the initiation of meanders. As far as possible, the theory is checked against observations on natural and model streams.

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INTERCEPTION OF RAIN AND SNOW BY SECOND-GROWTH PONDEROSA PINE.

By P. B. Rowe and T. M. Hendrix; Trans. Amer. Geo. Union, Vol. 32, No. 6, pp. 903-908. December 1951.

This paper reports the results of a six-year study to determine interception loss in a fully stocked 65- to 75-year-old second-growth ponderosa pine stand situated near Bass Lake, California. Interception loss was computed as the difference between measured precipitation and the sum of measured throughfall and stemflow.

The average annual precipitation was 47 inches, of which about 84 percent reached the forest floor as throughfall and four percent as stemflow. Twelve percent was interception loss. Throughfall, stemflow, and interception loss were directly related to storm size. Regression graphs and equations based upon this relation are given, which permit estimates of interception loss from storm precipitation. An average of four percent more precipitation reached the forest floor during snow than during rainstorms. However, estimates of annual interception loss are not appreciably improved by use of separate regressions for snowstorms and rainstorms. The interception process is illustrated by rate graphs showing when and how interception loss occurred during a typical storm. Interception loss consisted principally of the water retained by the vegetation during its initial wetting plus that lost by evaporation from the vegetation during storm intervals without precipitation.

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TURBULENCE FLUME TO MEASURE BED LOAD.

By Maurice L. Albertson; Trans. Amer. Geo. Union, Vol. 32, No. 6, pp. 909-911. December 1951.

In order to develop a method of measuring bed load in an alluvial stream, a turbulence flume was designed and tested. This flume has a number of advantages over other methods of measuring bed load because it operates continuously so

that the entire load of the stream could be measured by means of suspended load samplers. The extreme roughness of the baffles eliminated the effect of the Reynolds' number in the immediate vicinity of the turbulence flume, thereby making it possible to utilize model studies for determining in advance the optimum size and arrangement of baffle plates. The structure has been in use for three years and has operated satisfactorily as predicted.

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THE RELATIVE MERITS OF INORGANIC AND ORGANIC SOURCES OF PLANT NUTRIENTS.

By J. S. Joffe; Better Crops with Plant Food; Vol. 36, No. 3, pp. 9-12. March 1952.

The author discusses the relative values of organic and inorganic sources of plant food.

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THE MAGIC OF NITROGEN.

By C. J. Chapman; Better Crops with Plant Food; Vol. 36, No. 3, pp. 13-16. March 1952.

This article shows the importance of using abundant supplies of nitrogen for high crop yields.

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INVENTORYING SOIL IMPROVEMENT.

By Ford S. Prince; Better Crops with Plant Food; Vol. 36, No. 3, pp. 17-22 and 39. March 1952.

The author believes that the increased activity in rapid soil testing may make it possible to evaluate, with some degree of accuracy, the progress being made in soil improvement.

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BRUSH AND WEED CONTROL INVESTIGATIONS ON RANGELAND OF THE SOUTHERN GREAT PLAINS.

By E. H. McIlvain and D. A. Savage; USDA BPI, SAE and Okla. Agr. Expt. Sta., Mimeo. Feb. 13, 1952.

This is a progress report of experiments for control of sand sagebrush and other shrubs with fire grubbing, railing, one-waying, mowing, and chemical weed killers on range land. Results of grazing studies on treated and untreated areas are also included.

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COST OF WATER FOR IRRIGATION ON THE HIGH PLAINS.

By A. C. Magee, W. C. McArthur, C. A. Bonnen, and W. F. Hughes; Texas Agr. Expt. Sta. Bul. 745.

February 1952.

This bulletin reports data concerning pumping costs gained during 1947, 1948, and 1949 in a study of a yearly average of 176 wells in Lubbock, Hockley, Hale, Floyd, and Swisher Counties. Included are the costs for installation and for operation. During this study, the cost of developing and equipping a new irrigation well in this area usually ranged between \$4,000 and \$5,000.

GRASS SILAGE IN OKLAHOMA.

Okla. Agr. Expt. Sta. Cir. No. C-135. February 1952.

Grass silage can be produced on sloping or shallow soils where erosion is a hazard when row crops are grown. As compared to hay, it preserves much more of the carotene (provitamin A) essential for livestock health in late winter and early spring. Silage can be put up during weather which is too damp for proper curing of hay.

When good pasture is not available, silage provides succulence in the ration, thus helping make the entire ration more palatable to livestock. A silo helps carry some of the benefits of flush, early summer pasture over into the late summer dry season and on into the winter and early spring.

BRUSH, GRASS, BEEF AND DOLLARS.

By Harley A. Daniel; Amer. Forests, March 1952.

This article describes how millions of acres of range land, which are infested with scrubby brush and other worthless plants, can be reclaimed and put to work producing grass for livestock. This is accomplished by using brush-killing chemicals, new machines, and modern labor-saving methods.

METHODS AND EQUIPMENT FOR HARVESTING LADINO CLOVER SEED.

By George B. Hanna; W. H. Sheldon, and W. M. Carleton; Mich. Agr. Expt. Sta. Quarterly Bulletin, Vol. 34, No. 3, pp. 320-326. Feb. 1952.

Experimental work begun at Michigan State College in 1944 indicates that the vacuum-type harvester recovers more ladino seed than other methods.

A DETERMINATIVE STUDY OF AMYLOLYLIC, STENOTHERMO-

PHILIC BACTERIA ISOLATED FROM SOIL.

By Egon Stark and P. A. Terrault; Scientific Agr., Vol. 32, No. 2, pp. 81-92. February 1952.

This paper discusses the results of an investigation dealing with the breakdown of starch by bacteria at high temperatures by 34 cultures of bacteria isolated from muck soil in northern Indiana.

STUDIES ON THE HOLOCELLULOSE FRACTION OF HARDWOOD LEAVES.

By B. B. Coldwell and W. A. DeLong; Sci. Agr., Vol. 32, No. 2, pp. 99-108. February 1952.

The purposes of this study were: (a) to determine whether large samples of chlorite holocellulose could be prepared from fresh and partially decomposed leaves of different species; (b) to characterize the lignin-like material in the leaf tissue and that retained in the corresponding holocellulose fractions, and (c) to examine the hydrolytic products of the holocellulose fractions to obtain further information respecting the nature of the decomposition processes.

EROSION CONTROL IN ENGINEERING WORKS.

By Louis J. Goodman; Agr. Eng., Vol. 33, No. 3, pp. 155-157. March 1952.

This paper summarizes 8-1/2 months of research on hydromechanical studies of soil erosion processes.

EFFECT OF RATE AND METHOD OF APPLYING SOURCES OF NITROGEN UPON THE YIELD AND COMPOSITION OF BERMUDA GRASS, CYNODON DACTYLON (L) PERS., HAY.

By Glenn W. Burton and Earl H. DeVane; Agron. Jour., Vol. 44, No. 3, pp. 128-132. March 1952.

Nitrate of soda, ammonium nitrate, uramon, and cyanamid were applied at annual rates of 50, 100, 200, and 400 pounds of N per acre in three ways (single and split applications) to a high yielding Bermuda grass hybrid growing on a Tifton sandy loam for a 3-year period.

Annual hay yields ranged from 1 ton of hay per acre with no nitrogen to 8 tons per acre where 400 pounds of N per acre had been applied. Relative yields of 100, 107, 86, and 77 were obtained from nitrate of soda, ammonium nitrate, cyanamide, and uramon, respectively.

Nitrogen applications significantly increased the protein and fiber, significantly reduced the

ash and nitrogen-free extract, and had no significant effect upon the fat, calcium, phosphorus, and potassium content of the hay.

basis of tillage depth (deep - more than 7 inches; medium - 5-7 inches; shallow - less than 5 inches) and analyzed for significance between treatment of mean differences.

EFFECT OF ORGANIC MATTER ON PHOSPHATE AVAILABILITY.

By Joseph D. Dalton, Glenn C. Russell, and Dale H. Sieling; Soil Sci., Vol. 73, No. 3, pp. 173-181. March 1952.

The purpose of this investigation was to determine by plant uptake the relative availability of the phosphate precipitated by iron and aluminum under acid conditions and to determine the effectiveness of organic matter in making available to plants the phosphate fixed in acid soils or contained in rock phosphate. It was found that organic matter was effective in increasing the availability of soil phosphate. Easily decomposable organic matter was more effective in this regard than organic substances which decomposed slowly. The activity of organic matter in making soil phosphate available was attributed to the ability of certain metabolic products of microbial decomposition to form stable molecules with the iron and aluminum that are responsible for phosphate fixation in acid soils.

RECOVERY OF FERTILIZER NITROGEN BY OATS IN THE GREENHOUSE.

By W. V. Bartholomew and A. E. Hiltbold; Soil Sci., Vol. 73, No. 3, pp. 193-201. March 1952.

Isotopic nitrogen N 15 was used in greenhouse pot experiments with oats to measure recovery of fertilizer nitrogen as affected by rate of applications and treatment of the soil with crop residues. Plant yield and nitrogen uptake were lower in soils to which corn fodder had been added than in soils to which alfalfa or no plant residue had been applied. Plant uptake of nitrogen from the fertilizer increased in direct proportion to the rate of application. Recoveries in the total crop ranged from 27 to 54 percent of the nitrogen applied.

EFFECT OF TILLAGE DEPTH ON SOIL CONDITIONS AND COTTON PLANT GROWTH FOR TWO ALABAMA SOILS.

By V. C. Jamison, I. F. Reed, C. M. Stokes, and Tom E. Corley; Soil Sci., Vol. 73, No. 3, pp. 203-210. March 1952.

Several seedbed preparation methods, varying chiefly in depth of tillage, were compared as to their effect on soil and cotton-plant characteristics on Greenville fine sandy loam and Decatur clay soils. The treatments were grouped on the

POROUS TUBE DEVICE FOR SAMPLING SOIL SOLUTIONS DURING WATER-SPREADING OPERATIONS.

By Ray B. Krone, H. F. Ludwig, and Jerome F. Thomas; Soil Sci., Vol. 73, No. 3, pp. 211-219. March 1952.

This paper describes an improved method for sampling the soil solutions during water-spreading operations involving the use of a porous tube or "probe" to which negative pressures or tensions are applied. The probe extracts water from soil by forming a hydromatic sink.

STABILITY OF DDT AND ITS EFFECT ON MICROBIAL ACTIVITIES OF SOIL.

By L. W. Jones; Soil Sci., Vol. 73, No. 3, pp. 237-241. March 1952.

This study was designed to find at what concentrations DDT would be non-toxic to microorganisms and when added in toxic concentrations the duration of the injury and the stability of DDT.

No injury to nitrifiers, ammonifiers, and sulfur-oxidizing microorganisms was noted from concentrations of DDT ordinarily added to soils. In all cases toxicity began to be manifested at concentrations of about 0.1 percent.

No injury to the nitrogen-fixing bacteria was observed in soils containing concentrations of DDT as high as 1 percent.

DDT added to the soil was remarkably stable during the first year of storage but by the end of the second and third years appreciable breakdown had occurred. The breakdown was greater in soils containing the lowest concentrations of DDT and also in soils high in organic matter.

SURFACE DRAINAGE OF TIGHT SOILS IN THE MIDWEST.

By Keith H. Beauchamp; Agr. Eng., Vol. 33, No. 4, pp. 208-212. April 1952.

This paper describes a number of drainage systems which are suitable for draining surface water from the tight soils in the midwest.

COMPARISONS BETWEEN SPRAY AND SOIL APPLICATIONS OF NITROGEN ON WHEAT.

By C. E. Evans, P. L. Brown, R. W. Carpenter, H. V. Eck, H. J. Haas, J. L. Krall, G. A. Mitchell, M. M. Oveson, R. E. Ramig, and R. M. Williams; USDA, ARA-BPISAE, Research Report No. 236. February 29, 1952.

This study was conducted to obtain more information on the use of sprays as a means of supplying fertilizer nitrogen to wheat. Experiments were conducted at seven locations in the Great Plains and at two locations in Oregon during 1951. The objectives were: (1) to determine the influence of varying rate, concentration, and time of applying nitrogen as a spray on the yield and protein content of wheat, (2) to compare the effectiveness of spray versus soil applied nitrogen in increasing yield and protein content of wheat, and (3) to relate the nitrogen and moisture status of both crop and soil to crop response under varied conditions.

All experiments included rates of 0, 25, and 50 pounds of nitrogen per acre using ammonium nitrate for soil applications and urea for foliar applications.

GREENHOUSE STUDIES OF PLANT COMPOSITION AS AFFECTED BY FERTILIZER TREATMENTS AND STAGE OF GROWTH OF ALFALFA ON A CECIL SANDY LOAM.

By E. H. Stewart; USDA, ARA-BPISAE and S. C. Agr. Expt. Sta. Research Report No. 238. March 1, 1952.

The purposes of this study were to determine: (1) The correlation between plant-nutrient concentration and yield with different fertilizer treatments. (2) The plant tissue and the stage of growth that will best serve as an index to the status of the nutrient level of phosphorus and potassium.

The results indicate that there is a sufficiently close relationship between the potassium content of the alfalfa plant and yield response resulting from fertilizer treatments to indicate the plants' needs.

The potassium content of mature plant tissue appears to offer a better indication of the potassium nutrition status of the plant than does that of new growth. Under the conditions of this experiment, potassium content in the mature alfalfa stems of less than one percent indicated that this element was either limiting or about to become so.

THE SILTING OF WEST FRANKFORT RESERVOIR.

By J. E. Stall, A. A. Klingebiel, S. W. Melsted, and E. L. Sauer; Ill. State Water Survey Division, Report of Investigation No. 12. 1951.

This paper is a report of silt surveys made in the West Frankfort reservoir.

BOTH CULTURAL AND CHEMICAL PRACTICES NEEDED TO PREVENT CRABGRASS IN LAWNS.

By R. R. Davis and C. J. Willard; Ohio Agr. Expt. Sta. Farm and Home Research, Vol. 37, No. 274, pp. 5-7. January-February 1952.

Experiments at Columbus and Wooster with chemicals for crabgrass control show good possibilities for ridding lawns of this pest. Three applications of a solution of phenyl mercuric acetate (PMA), applied one week apart starting June 21, gave excellent control of crabgrass in a heavily infested area at Wooster in 1951. The plots so treated remained virtually free of crabgrass throughout the season. Similar results were obtained at Columbus with both liquid and dry applications when applied either early or late.

Success with PMA solutions when used as either a pre-emergence or a post-emergence spray has been reported. The results reported above were obtained by making the first application when the crabgrass seedlings were in the 2-3 leaf stage. There is general agreement that PMA is more effective on seedling crabgrass than when it becomes older. The rate used was 5 pints of a 10 percent solution of PMA in 100 gallons of water per acre. Since there is a narrow margin between sufficient chemical to kill crabgrass and not enough to permanently injure lawn grasses, it is suggested that the recommendations of the manufacturer of the product used be followed closely.

PMA is also on the market in a dry form that can be applied with an ordinary fertilizer spreader. Dry forms of PMA are generally more expensive but safer for the layman to use than spray applications. Dry forms of PMA appear to be slightly more effective in combating mature crabgrass than spray applications. However, as with spray applications, dry forms of PMA usually do more damage to crabgrass if used when the crabgrass is in the seedling stage.

At best, chemical control of crabgrass is a temporary measure. Effective chemical controls give permanent lawn grasses a chance to "get the upper hand" in their struggle with crabgrass. Only with good management practices that keep lawn grasses healthy and vigorous will crabgrass be permanently subdued.

A PATTERN OF SCIENTIFIC INQUIRY FOR APPLIED RESEARCH.

By H. G. Wilm; Jour. of Forestry, Vol. 50, No. 2,

Ever since people started thinking they have tried to solve problems encountered in life. Almost as much effort has been spent figuring out more effective ways to gain these solutions. This has led to the development of scientific inquiry, a complex system of thought and action employed by trained people as they attempt to solve their problems.

This paper outlines a suggested pattern of inquiry, combining rapid techniques of logic with solid facts of experimental evidence. While such an amalgamation does not contain original contributions to knowledge, perhaps it will supply the worker in applied research more powerful weapons in his search for solutions to practical problems.

The suggested pattern is sketched under each of the following headings: setting up the problem, testing the hypothesis by exploration, testing the hypothesis by controlled experience, testing the hypothesis by controlled experiments, the experimental solution, and extension of the solution. These successive headings represent formal steps in a research procedure.

In solving any problem, however, not all of the steps may be necessary. Some of the intermediate ones may be omitted. Where the problem is not important or the solution is clearly provided by the experience of other workers, the steps of controlled experience and experiment may not be necessary. It may be possible to move directly from exploration to the solution of the problem and thence to the pilot project. In any investigation the appropriate combination of research steps depends on the importance of discussions which rest on the solution of the problem, and on the degree of certainty which can be reached by any of the steps.

As the research worker approaches a problem to be solved, he has to define it in clear-cut terms. He then examines it to see whether a reasonable solution can be worked out with the resources of personnel, money, and land at his disposal. If not, he may have to limit the problem even further. Otherwise he is ready to go ahead and develop an hypothesis to be tested. In doing this the research worker uses his mental capacities and experiences to consider a number of variables associated with his problem. He rejects some and retains others, until finally he has organized the remaining variables into a small group whose manipulation promises a successful solution to the problem. Then he is ready to formalize his thinking by stating a concrete hypothesis, describing the limitations of its solution, and start solving the problem.

None of the steps used are new in themselves. If there is anything intriguing in this presentation, it is the interweaving of these techniques into

a single, organized scientific method, with logic, exploration, experience, and experiment assuming their proper place. The steps may be contracted or expanded, but the pattern remains the same. Like a mountaineer, the research worker looks over his task and plans a practical route. Secured by the protecting rope of training, he moves rapidly up over the rocky obstacles until he feels unduly exposed -- especially if the footholds of his observations seem a little shaky. Then he stops and drives a spike, fastening himself to the cliff with the firm anchor of a quantitative experiment. And so he proceeds upward, keeping just the right balance between climbing and anchoring. If he anchors too often, all his time is consumed in driving spikes -- or making statistical analyses -- and he may never reach the summit. But if he climbs too far between anchor points, sooner or later he will fall. For the mountain climber or the research worker, the first course means lack of progress; the second may be fatal. For maximum progress, the anchor points or quantitative experiments must be chosen carefully.

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CONSUMPTIVE USE OF WATER ON IRRIGATED LAND.

By Wayne D. Criddle; Amer. Soc. Civil Engineers, Proc., Vol. 77, Separate No. 98. November 1951.

The amount of water consumed by agricultural crops is affected by many factors, of which climate is probably most important. Other influencing factors are soils, topography, water supply, irrigation practices, and the crops grown. The total depth of irrigation water required for consumptive use during the growing season is dependent on the effective precipitation that falls during the summer and the carry-over soil moisture from winter precipitation.

Perennial crops show wide variations in use of water at different locations of the West. Nearly 4-1/2 feet of water per year is normally used by alfalfa in the Phoenix and Yuma areas of Arizona. A minimum use where alfalfa is grown successfully occurs in the higher northern valleys and is probably about 1-1/2 feet of water per year. Annual crops usually do not show such a wide variation in use. Approximately 15 to 18 inches of water will be used consumptively in producing a good irrigated wheat crop regardless of where it is grown.

Water consumed by natural vegetation incidental to irrigation may vary widely. Probably the greatest factor influencing the proportion of an irrigation supply thus consumed is the relative cost of the water in relation to other farm costs and to the value of the crops produced. However, there are other factors involved that also affect this proportion.

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CONSUMPTIVE USE OF WATER BY FOREST AND RANGE VEGETATION.

By L. R. Rich; Amer. Soc. Civil Engineers Proc., Vol. 77, Separate No. 90. October 1951.

Consumptive use by forest and range vegetation depends on the amount and distribution of the rainfall, the climate, topography, and the storage capacity of the soils of the watershed as well as on the type of vegetation and the degree to which the vegetation use overlaps with the period of water surplus. The principal way in which man can influence water yield is by sound management and use of vegetation cover, through proper livestock grazing and timber harvesting, so that consumptive use overlaps and interferes least with the water-yielding period.

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ON THE STORAGE OF WATER IN ROCKS IN SITU.

By V. L. Bosazza; Trans. Amer. Geo. Union, Vol. 33, No. 1, pp. 42-48. February 1952.

Plotting maximum yield in relation to maximum drawdown of a pumped well offers a method of evaluating the available porosity in the vicinity of the borehole. The process can be reversed by pumping a measured volume of water down the borehole. A distinction is made between pore space or storage around the borehole and the more difficult to determine, communicating pore space.

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LABORATORY EVALUATION OF DESERT SOILS FOR IRRIGATION.

By V. S. Aronovici; Trans. Amer. Geo. Union, Vol. 33, No. 1, pp. 49-52. February 1952.

A simple laboratory technique of evaluating desert soils for suitability to irrigation is outlined. Such laboratory observations are for the purpose of augmenting a field examination of physiographic and pedological limitations of the land. The method is based upon the premise that soil moisture retained against a tension of 100-cm. water tension, less the moisture retained against 15,000-cm. tension, gives an index of total available water in the soil. The importance of the relative distribution of available moisture within the tension range of 100 and 15,000-cm. is indicated.

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SOME EVALUATIONS OF SUSTAINED CLOUD-SEEDING OPERATIONS.

By I. P. Krick and T. B. Smith; Trans. Amer. Geo. Union, Vol. 33, No. 1, pp. 53-56. February 1952.

Evaluations of several cloud-seeding projects are discussed. These projects included portions of northeastern New Mexico, southeastern Colorado, and eastern Oregon, and were conducted during July to December 1950. These evaluations are statistical in nature and involve comparisons with the precipitation occurring in nearby unseeded areas. A multiple-regression equation was developed from past data relating precipitation in seeded and unseeded areas. In six of the seven months of operation, actual rainfall in the seeded area exceeded the estimate provided by the regression equation. A suggestion of a possible smoothing effect in precipitation patterns due to seeding is also presented.

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PHREATOPHYTES AND THEIR RELATION TO WATER IN WESTERN UNITED STATES.

By T. W. Robinson; Trans. Amer. Geo. Union, Vol. 33, No. 1, pp. 57-61. February 1952.

Phreatophytes, plants that depend on ground water for their water supply, cover about 15 million acres in the 17 Western States, and may waste as much as 20 to 25 million acre-feet of water into the atmosphere annually. There are many variable factors that affect the growth and use of water by the plants, but present-day knowledge of them is limited. The water used by these plants probably represents the largest source of reclaimable water in the arid western United States. Although it appears feasible to salvage a part of this water, methods for doing so have not passed the experimental stage. In Nevada, it is estimated that it would be practical to salvage about 25 percent of the water wasted annually, or about 400,000 acre-feet. This would be sufficient to irrigate about 133,000 acres of alfalfa having a crop value of \$10,000,000.

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DETERMINING EVAPOTRANSPIRATION BY PHREATOPHYTES FROM CLIMATOLOGICAL DATA.

By Harry F. Blaney; Trans. Amer. Geo. Union, Vol. 33, No. 1, pp. 61-66. February 1952.

Before the available water resources of a drainage basin in arid and semi-arid regions can be satisfactorily ascertained, careful consideration must be given to the consumptive-water requirements of phreatophytes (or water-loving vegetation) and other types of natural vegetation and agricultural crops. The moisture requirements of natural vegetation are usually satisfied before water becomes available for irrigation and other purposes. Although evapotranspiration (consumptive use) by phreatophytes has been measured at various times and places during the past 40 years, very little data are available in most sections of the United States.

This paper presents data on measured evapotranspiration by phreatophytes and describes a method of determining rates of water consumption in areas where no measurements except climatological data are available. Briefly, the procedure is to correlate existing evapotranspiration data with monthly temperature, monthly percentages of yearly daytime hours, and growing period. The coefficients so developed for different kinds of vegetation are used to transpose the evapotranspiration data for a given area to other areas for which only climatological data are available.

USE OF WATER BY PHREATOPHYTES IN 2000-FOOT CHANNEL BETWEEN GRANITE REEF AND GILLESPIE DAMS, MARICOPA COUNTY, ARIZONA.

By S. F. Turner and H. E. Skibitzke; Trans. Amer. Geo. Union, Vol. 33, No. 1, pp. 66-72. Feb. 1952.

This is a summary of data obtained in a study of transpiration by phreatophytes in the channels of the Salt and Gila Rivers, between Granite Reef and Gillespie dams, Maricopa County, Arizona. The study was made in the spring of 1950. The kind and amount of phreatophyte growth was mapped in the area covered by a proposed flood-control channel, 2000 feet wide, extending between the two dams. Most of the mapping was done from the air, using recent aerial photos. Transpiration by the phreatophytes was computed using the results of the mapping combined with water-use factors developed by experimental work. Estimates of future phreatophyte use and of the amount of water that might be saved by clearing and maintaining the channel area were based on extensions of water-level graphs to include the next 50 years, and on the experimental work at Safford. The estimates were as follows: (1) total estimated transpiration from ground water at time of investigation - 29,000 acre-feet per year; (2) estimated average transpiration from ground water, within the channel area, during period 1950-1999 (a) without Colorado River water - 22,200 acre-feet per year, (b) with Colorado River water in 1960 - 29,900 acre-feet per year; (3) estimated average water saving effected by channel clearing, 1940-1999 (a) without Colorado River water - 16,600 acre-feet per year, (b) with Colorado River water in 1960 - 22,400 acre-feet per year.

WATER CONSERVATION THROUGH ELIMINATION OF UNDESIRABLE PHREATOPHYTE GROWTH.

By Curtis W. Bowser; Trans. Amer. Geo. Union, Vol. 33, No. 1, pp. 72-74. February 1952.

A point is now being reached in our agricultural planning, especially in the Southwest, that all

measures must be considered in extending the limited water supply. The removal of phreatophytes, which annually use enormous quantities of water in a very nonbeneficial manner, is one method of augmenting the present supply. Existing eradication methods, post-treatment control, and land-use procedures need additional refinement and further development before a fully effective phreatophyte-elimination program can be consummated.

PHREATOPHYTE CONTROL ON IRRIGATION PROJECTS IN NEW MEXICO.

By John G. Koogler; Trans. Amer. Geo. Union, Vol. 33, No. 1, pp. 74-77. February 1952.

The problem of increased growths of nonbeneficial phreatophytes on operating irrigation projects in New Mexico and the relationship with the water supply available is shown to be one of increasing concern. The methods employed and the results of eradication programs are shown, indicating that additional experimentation and treatments must be performed prior to complete elimination of the phreatophytic growths.

AGRICULTURAL HYDROLOGY AS EVALUATED BY MONOLITH LYSIMETERS.

By L. L. Harrold and F. R. Dreibelbis; USDA Tech. Bul. No. 1050. December 1951.

This bulletin is in the nature of a progress report on the lysimeter investigations carried on at the North Appalachian Experimental Watershed near Coshocton, Ohio, to 1949.

The hydrologic data were obtained from 11 monolith lysimeters, each 0.002 acre in area and 8 feet deep, 3 of which were weighed automatically. The features of the installations, some of which are unique, are described. Records of precipitation, runoff, and percolation are presented for each lysimeter. Weight records provided data for determination of condensation-absorption of moisture from the atmosphere, evapotranspiration of soil moisture, and changes in storage of soil moisture.

STUBBLE TROUBLE.

By William L. Southworth; The Oregon Farmer, pp. 5-6 and 27. April 3, 1952.

This is a discussion of the various ways of disposing of wheat stubble and their effects on soil and water losses by erosion and the yields of succeeding crops.

QUALITY AND QUANTITY OF SEED FROM BITTERWEED
KILLED WITH HERBICIDES.

By Omer E. Sperry and Judd Morrow; Texas Agr.
Expt. Sta. Prog. Rpt. 1447. March 8, 1952.

A decided reduction of the bitterweed population can be obtained by killing plants with herbicides. Proper stocking and deferment of pastures to increase grass vigor and ground cover, together with spray treatments, should be practiced to control the annual weed growth. A decrease in noxious weed population and an increase in desirable grasses are essential if we are to realize more production from bitterweed-infested range areas.

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CHEMICAL CONTROL OF CRABGRASS IN SPECIAL PURPOSE TURF.

By J. R. Watson, Jr., and E. D. Cook; Texas Agr. Expt. Sta. Prog. Rpt. 1450. March 21, 1952.

Results obtained from crabgrass-control tests conducted at the Kirbyville station during 1951 indicate that potassium cyanate, sodium arsenite, and phenyl mercuric acetate will give effective control of crabgrass in Bermuda grass turf.

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DESIRABLE GRASSES INCREASE AFTER POST OAK CONTROL.

By Vernon A. Young; Texas Agr. Expt. Sta. Prog. Rpt. 1448. March 15, 1952.

Under a nongrazing practice, a thin but not over-utilized vegetation on a cleared second-growth post oak area near College Station increased in 2 years to such an extent that, under proper management, it would become a permanent and profitable asset to the ranching industry in this region.

Under similar management, it is highly possible that 9 million acres in Texas now supporting post oak would react similarly and add much potential forage wealth to the State.

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RANGE MANAGEMENT STUDIES ON THE RANCH EXPERIMENT STATION.

By Leo B. Merrill and Vernon A. Young; Texas Agr. Expt. Sta. Prog. Rpt. 1449. March 15, 1952.

This grazing study showed that on heavily stocked pastures utilized yearlong, both livestock weights and vegetational condition substantially declined, as compared with either the lightly or moderately grazed pastures. On moderately-stocked

yearlong pastures, slight improvement occurred in vegetational condition, but livestock weights declined during the drouth from September 1950 through June 1951. The moderately stocked rotation pastures showed more improvement than the moderately stocked pastures grazed yearlong.

The lightly stocked pastures showed a marked improvement in both vegetational condition and livestock weights over the other two rates of yearlong stocking. Rotation pasture 15, which was rested through two growing seasons, improved equally as much in vegetational condition as the lightly stocked pastures. During the period from July 1950 through June 1951, the deferred rotation pastures produced greater cattle gains, both per head and per acre, than other pastures. Sheep and goats showed the same general trend, although the differences were not as pronounced.

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RADIOISOTOPES IN SOIL FERTILIZER RESEARCH.

By James M. Blume; Jour. Amer. Plant Food Council, Inc., Vol. 6, No. 1, pp. 2-5 and 13. January-February-March. 1952.

This is a review of the progress made with the use of radioisotope in fertilizer research during 1948-1952.

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FERTILIZER PRACTICES IN THE BALANCED FARMING PROGRAM IN MISSOURI.

By Arnold W. Klemme; Jour. Amer. Plant Food Council, Inc., Vol. 6, No. 1, pp. 6-9, and 14. January-February-March. 1952.

This article discusses fertilizer practices used in the balanced farming program in Missouri. The balanced farming program is an integration of all sound practices and helpful suggestions coming from reported research and farmer experience into a program for a particular farm and its family so as to obtain the highest possible net income.

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WISCONSIN BANKERS FINANCE SURE-FIRE ALFALFA PROGRAM.

By Emil Truog and Arthur E. Peterson; Jour. Amer. Plant Food Council, Inc., Vol. 6, No. 1, pp. 10-13. January-February-March. 1952.

Experiments and demonstrations during the past ten years have shown that a four ton yield of alfalfa hay can be what we now call a sure-fire proposition on most of the 3,000,000 acres of Spencer silt loam in north central Wisconsin, provided that an initial heavy application of lime and fertilizer is made. This land,

generally, is yielding only about 1-1/2 tons per acre of rather poor quality hay, and had been thought to be wholly unsuited for alfalfa production.

CHEMICAL WEED CONTROL IN COTTON.

By V. S. Searcy; Ala. Agr. Expt. Sta. Prog. Rpt. Series No. 51. April 1951.

Controlling weeds is one of the major costs in producing cotton. The amount of hand labor required to produce an acre of cotton has changed very little since the beginning of cotton production. With the advent of chemical weed control it is possible to reduce the pre-harvest hand labor requirements in cotton production from 75 to 100 percent.

MESQUITE SEED AND SEEDLING RESPONSE TO 2,4-D and 2,4,5-T.

By Byron O. Blair; The Botanical Gazette, Vol. 112, No. 4, pp. 518-521. June 1951.

This paper presents the results of studies on germinating seeds and young seedlings of mesquite. The points investigated were: (a) the response of mesquite to certain organic herbicides in comparison with other plants already tested, (b) the comparative toxicity of 2,4-D acid and 2,4,5-T to mesquite seeds and seedlings, and (c) the response of seeds and seedlings tested in this manner in comparison with that of mature trees tested with foliage sprays of 2,4-D and 2,4,5-T.

SOME EFFECTS OF LIVESTOCK GRAZING ON PONDEROSA PINE FOREST AND RANGE IN CENTRAL WASHINGTON.

By Robert S. Rummell; Ecology, Vol. 32, No. 4, pp. 595-607. October 1951.

A study of ungrazed Meeks Table and grazed Devils Table in central Washington provided evidence that parts of the virgin ponderosa pine forest contained dense mats of herbaceous understory vegetation and sparse stands of tree reproduction. Pinegrass dominated and elk sedge was a minor part of the understory virgin flora.

Densities of herbaceous understory vegetation on ungrazed Meeks Table were 183 percent to 254 percent of the densities on grazed Devils Table. Herbage yields of pinegrass were strikingly different between the two Tables. Pinegrass beneath open ponderosa pine produced 850 pounds of air-dry herbage per acre on Meeks Table compared to only 240 pounds on Devils Table. While the timber overstories on the two Tables were similar,

Meeks Table had only a very few small trees but Devils Table had 3,291 small trees per acre.

The high density of herbaceous understory vegetation on Meeks Table contributed substantially to the deficiency of advance tree reproduction. Heavy grazing of the herbaceous understory vegetation, rather than exclusion of fire, appeared to be the prime factor in explaining the dense advance tree reproduction on Devils Table.

A METHOD FOR MEASURING TREND IN RANGE CONDITION ON NATIONAL FOREST RANGES.

By Kenneth W. Parker; USDA, Forest Service Mimeo. October 17, 1951.

The primary objective of this study was to develop a method or methods which are simple, practical, accurate, technically sound, and which will yield concrete measurements as well as sound observational evidence of trend.

TENTATIVE GUIDES TO RANGE CONDITION, TREND, AND USE FROM ROOSEVELT STUDY.

By Elbert H. Reid; USDA, Forest Service, Mimeo. June 5, 1951.

This paper presents guides, based upon the studies made on the Roosevelt National Forest in 1950 for possible use in judging range condition and use of somewhat comparable areas, especially on other allotments of the Roosevelt Forest.

THE HALOGETON PROBLEM IN UTAH.

By L. A. Stoddart, Glen T. Baird, George Stewart, Ben S. Markham, and Howard Clegg; Utah Agr. Ext. Service, Extension Bulletin 250. June 1951.

This is a discussion of the Halogeton problem in Utah.

RECOMMENDATIONS FOR RANGE RESEEDING IN UTAH.

By George Stewart, L. A. Stoddart, Harold J. Burback, J. A. Libby, R. L. Whigley, D. M. Gaudin and Robert A. Roundy; Utah Agr. Ext. Service, Ext. Bul. 212. January 1951.

This publication outlines a method for reseeding ranges.

CRESTED WHEATGRASS GRAZING VALUES.

By E. J. Wolfolk; USDA, Mont. Forest and Range Expt. Sta. Research Note No. 91. March 1951.

Several important lessons in the grazing of crested wheatgrass were learned during this 11-year study. Perhaps foremost of these is the fact that crested wheatgrass, for spring and early summer grazing, is a highly palatable, nutritious grass capable of producing rapid gains in feeder cattle. In the event of early fall rains it will renew growth and provide considerable grazing until or even after frost occurs. These two seasons, spring-early summer and fall, are undoubtedly the best times of the year to graze crested wheatgrass.

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RESPONSE OF WYETHIA TO 2,4-D.

By A. B. Evanko; Mont. Forest and Range Expt. Sta. Research Note No. 98. April 1951.

Spraying mulesears wyethia-infested ranges in southwestern Montana in mid July 1949, with 6,000 and 10,000 parts of 2,4-D acid per million parts of water or diesel oil, almost completely eliminated the mulesears. The plants were mostly past the bloom stage at the time of treatment. The two spray concentrations were equally effective in reducing the mulesears' density. One year after treatment perennial grasses showed no increase in density assignable to reduced competition following removal of mulesears. A reduction of total perennial weed cover was caused by both concentrations of 2,4-D. Annual weed cover the year following treatment was apparently unaffected by any of the treatments.

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ST. JOHNSWORT ON WESTERN RANGES.

By Grant A. Harris; Mont. Forest and Range Expt. Sta. Station Paper No. 26. February 1951.

St. Johnswort, a poisonous perennial weed introduced into the United States from Europe, now occupies more than two million acres of range land in California and the Pacific Northwest. Though poisonous to livestock, it seldom is fatal, but does great damage by reducing the grazing capacity of the infested range and by causing losses of weight and condition in the affected livestock.

Complete eradication of this weed now seems impossible. Control methods must be cheap and effective, and control should include reseeding of treated range to cover the bare soil left by the removal of St. Johnswort.

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COMPARISON OF ORGANIC MATTER FRACTIONS FROM THREE SOIL TYPES.

By F. J. Sowden, Doreen I. Parker, and H. J. Atkinson; Sci. Agr., Vol. 32, No. 3, pp. 127-134. March 1952.

The purpose of this study was to compare the organic matter of three distinctive types of soil after it had been subjected to extensive fractionation. A podsol, a dark brown prairie soil, and a black soil were used. Many indications were found of a fairly strong union between some of the inorganic and organic colloids. Many of the organic fractions contained a considerable amount of "ash" which was not greatly reduced by extractions with water, 1 percent HCl, and concentrated H₂SO₄, used to isolate the lignin. In spite of repeated extractions, the KCl flocs were high in their content of carbon and nitrogen; even the polyuronide complexes were not removed.

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RESIDUAL VALUES OF CERTAIN INSECTICIDES AGAINST ADULTS AND LARVAE OF PHYLLOPHAGA SPP.

By G. H. Hammond; Sci. Agr., Vol. 32, No. 3, pp. 143-149. March 1952.

The purpose of this study was to determine the effectiveness of soil treatment with insecticides on the control of the June beetle. BHC was by far the most effective of the insecticides tested against adults and larvae. An application of 20 pounds per acre of gamma BHC almost eliminated white grubs in the first year. Surface application to permanent turf at relatively low rates should be effective in protecting arboreal foliage in preventing grub damage to plant roots. DDT, chlordane, aldrin, or diel-drin used at relatively higher rates per acre, may be applied to areas where tainting of crops is a primary consideration.

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THE NITROGEN DISTRIBUTION AND AMINO ACID CONTENT OF CERTAIN SOIL ORGANIC MATTER FRACTIONS.

By Doreen I. Parker, F. J. Sowden and H. J. Atkinson; Sci. Agr., Vol. 32, No. 3, pp. 163-169. March 1952.

This paper reports the results of a study to determine the nitrogen distribution and amino-acid composition of three soils and of the organic fractions isolated from them, and to see whether or not the nitrogen-containing materials in the different soils and in their various fractions are similar.

No distinctive differences in the Van Slyke nitrogen distribution were noted either between soils or between different fractions of the same soil. Glutamic acid, glycine, threonine, valine, and leucine were found in all the fractions; aspartic acid, serine, and lysine in nearly all;

alpha- and B-alanine in about two thirds; and the others - histidine, proline, hydroxyproline, arginine, phenylalamine - in less than no sulphur - containing amino acid and very little arginine and histidine were found.

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THE NORMAL PATTERN OF SOLAR RADIATION AT EAST LANSING, MICHIGAN.

By George A. Crabb, Jr., Mich. Academy of Sci., Arts and Letters, Vol. 36, pp. 173-176. Pub. 1952.

The author compared the annual patterns of solar radiation received at East Lansing, Michigan, as determined by weekly average radiation-receipt method, with that based on a fifteen-day moving average method.

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HOW FARMERS MAKE PASTURE PLANS TO MEET THE UNCERTAINTY OF WEATHER.

By Ernest J. Nesius; Kr. Agr. Expt.Sta. Bul. 575. December 1951.

This bulletin describes how farmers in the Bluegrass region of Kentucky make their plans for meeting and controlling seasonal variation as either (1) fitting the pasture to the livestock by making adjustments directly involving the production of pasture forage, or (2) fitting the livestock to the pasture by adjustments in the numbers, kinds, and production methods of livestock according to changes in pasture production.

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WEED CONTROL WITH METHYL BROMIDE.

By J. C. Kopitke and Jesse K. R. Langford; Jour. of Forestry, Vol. 50, No. 3, pp. 208-211. March 1952.

Methyl bromide treatment of nursery land provides a completely nonselective method of weed control without leaving any harmful residue in the soil depending upon the quantity of material used per unit area. It provides essentially complete control of weeds as well as excellent control of damping-off organisms.

While its known effects are limited to seeds and organisms existing in the soil at the time of treatment, it gives effective control of such existing soil pests as white grubs and nematodes. Fall treatments of methyl bromide were completely effective in controlling winter annuals, most of which have had to be removed by hand weeding in the past.

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POST OAK AND BLACKJACK OAK.

By B. W. Allred; Sheep and Goat Raiser, Vol. 32, No. 8, pp. 22-23. May 1952.

This is a review of the results of the work being done with 2,4-5-T, 2,4-D and diesel oil mixtures in the eradication of post oak and blackjack oak on rangelands in the Southwest.

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REPORT ON SEDIMENTATION IN CARNEGIE LAKE, PRINCETON, NEW JERSEY.

By William R. Moore, H. James Ferris, and John Kozachyn; USDA, SCS-TP-109. March 1952.

Carnegie Lake is located on the Millstone River at the point of its juncture with Stony Brook, its main tributary. Investigations show that because of permeable soils, low-stream gradient, and dams on most of its tributaries, the Millstone River contributes very little sediment to Carnegie Lake.

The sedimentation survey of the lake shows that over 410 acre-feet of sediment has been deposited in it during the past 42.8 years. The resultant reduction in total storage capacity amounts to 30.3 percent.

Considering only the Stony Brook Watershed, the annual rate of sediment accumulation is .20 acre-feet per square mile of drainage area. Actually, the rate of sediment production is considerably higher than is indicated by these figures. An estimated 60 percent of the sediment carried into the lake is not deposited, but is carried out over the spillway. This can be attributed to the low-trap efficiency of this channel-type reservoir due to the low-capacity inflow ratio.

The rate of storage depletion of Carnegie Lake is high because of a moderately high rate of sediment production from the Stony Brook Watershed and the small amount of storage capacity provided for the size of drainage area.

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A CONCEPT CONCERNING THE MEASUREMENT OF AVAILABLE SOIL NUTRIENTS.

By Maurice Fried and L. A. Dean; Soil Sci., Vol. 73, No. 4, pp. 263-271. April 1952.

The concept that a plant having two sources of a nutrient will absorb its nutrients from each of these sources in direct proportion to the amounts available has the following logical consequence: The quantity of available nutrient in the soil can be determined in terms of a standard, provided the proportion of the nutrient in the plant derived from this standard is determined. The

mathematical expression of this relationship is as follows:

$$A = \frac{B(1-y)}{y}$$

where A = amount of nutrient available in the soil; B = amount of nutrient in the standard; y = proportion of the nutrient in the plant derived from the standard.

USE OF CA⁴⁵ LABELED CALCIUM CARBONATE IN DETERMINING PROPORTIONS OF NATIVE AND ADDITIVE CALCIUM IN LYSIMETER LEACHINGS AND IN PLANT UPTAKE.

By Henry C. Harris, W. H. MacIntire, C. L. Connor, W. M. Shaw, S. H. Winterberg, and S. L. Hood; Soil Sci., Vol. 73, No. 4, pp. 289-298. April 1952.

Labeled calcium carbonate was incorporated at several rates in Hartsells fine sandy loam and in Claiborne silt loam, and conventional lysimeter and greenhouse experiments were conducted to determine the migrations of native calcium and applied calcium in the rain-water drainage and in the crops grown on the same soils in pot cultures.

The findings of the lysimeter and greenhouse experiments were similar in general. Increasing the calcium incorporations caused increases in the leachings of total calcium and additive calcium in the lysimeter and crop experiments. Isotopic exchange between Ca⁴⁵ and the native soil calcium did not appear to be complete.

RADIATION EFFECTS ON PLANTS GROWN IN SOIL TREATED WITH FERTILIZER CONTAINING P³².

By James M. Blume; Soil Sci., Vol. 73, No. 4, pp. 299-303. April 1952.

Experiments were carried out with barley and oats grown in the greenhouse on soils that had received surface applications of KH₂PO₄ solution containing 0 to 12,500 microcuries P³² per grain of P³¹. Over this range, which includes concentrations much higher than those usually used in plant-nutrition studies, differences in dry weight of tops, phosphorus content of tops, and percentage of phosphorus in the tops derived from the fertilizer were, although sometimes statistically significant, too small appreciably to affect the data gained by the use of the isotope.

UPTAKE AND MOVEMENT OF FERTILIZER PHOSPHORUS.

By J. Jordon, C. Simkins, G. Corey, R. Knight,

and G. O. Baker; Soil Sci., Vol. 73, No. 4, pp. 305-313. April 1952.

The purposes of this experiment were (a) to determine the effect of moisture tension upon phosphorus uptake by potatoes from banded and broadcast superphosphate at various stages of growth; (b) to measure the proportion and total uptake of phosphorus supplied by the fertilizer and by the soil; (c) to study fertilizer phosphorus movement in the soil as influenced by applications of 1, 3, and 7.5 inches of water at each irrigation.

IRRIGATION EXPERIMENTS ON 1951 WHEAT-ALFALFA.

By Stephen J. Mech and Donald M. Lowe; Wash. Agr. Expt. Sta. Progress Report. March 1952.

This report presents the results from the 1951 irrigation experiments on wheat followed by a seeding of alfalfa after wheat harvest. It includes also some pertinent data from previous crops. Some conclusions have been drawn and are presented herewith. The basic data are presented in considerable detail.

COMPARATIVE TILLAGE TESTS AT EAST LANSING, MICHIGAN.

By James Tyson and George A. Crabb, Jr.; Mich. Agr. Expt. Sta. Quarterly Bul., Vol. 34, No. 4, pp. 412-424. May 1952.

This investigation was designed to study and evaluate stubble-mulch tillage practices. It extended over a 6-year period. The plow gave superior results, generally, to those obtained from other forms of tillage used. However, because of some harmful effects of plowing, it was felt that stubble-mulch tillage practices have potential value, when suitable weed-control and fertilization practices are developed to offset disadvantages found with these tillage practices.

Normal tillage produced higher yields of wheat and oats than other practices, but stubble-mulch practices gave equivalent or higher yields than normal tillage for corn. Disking produced significantly higher corn yields than all other tillage practices. There was no significant difference between yields of clover hay from any of the four systems of tillage. The weed problem was severe under all stubble-mulch tillage practices, as were plant-nutrient availability problems introduced by stubble-mulch practices. Infiltration of water into the soil was much greater with stubble-mulch than with normal tillage, and erosion losses were smaller.

PROGRESS REPORT ON THE WOODED WATERSHED OF THE

MICHIGAN HYDROLOGIC RESEARCH STATION.

By James L. Smith and George A. Crabb, Jr.;
Mich. Agr. Expt. Sta. Quarterly Bul., Vol. 34,
No. 4, pp. 383-394. May 1952.

The purpose of this study was to determine the manner in which freezing and thawing of soils on watersheds with varying types of land use contribute to runoff, erosion and flood flow under northern conditions, and to determine the fundamental hydrologic relationships of soils under varying types of land use, with special emphasis upon the movement of water through the soil profile during the fall and winter months.

MEASURING SOIL SPLASH AND PROTECTIVE VALUE OF COVER ON RANGE LAND.

By Ben Osborn; Texas Agr. Expt. Sta. Multi.
November 1950.

This is a description of the methods and equipment used in a study which measured soil splash and protective value of cover on range land.

RECLAIMING ILLINOIS STRIP COAL LANDS BY FOREST PLANTING.

By G. A. Linstrom and G. H. Deitschman; Ill.
Agr. Expt. Sta. Bul. 547. November 1951.

Eight conifers and ten hardwood species of trees can be recommended as likely, under specified conditions, to make satisfactory growth on lands strip-mined for coal in Illinois.

HOW VALUABLE ARE THE SOILS OF CENTRAL ILLINOIS.

By W. N. Thompson and P. E. Johnston; Ill. Agr.
Expt. Sta. Bul. 550. January 1952.

Variations in crop yields under good, poor, and fair soil management for selected central and north-central Illinois soil types were reported in Bulletin 522 entitled "How Productive Are the Soils of Central Illinois". This bulletin, reporting earnings on these soils, is a companion study based on 203 of the same farms. These 203 farms were selected because records of their financial operations were available for the ten years 1935-1944, and their soils belonged in one of the twelve more prevalent soil associations in this area.

THE NET WORTH OF OUR NORTHEASTERN SOILS.

By C. L. W. Swanson; Conn. Agr. Expt. Sta.

Special Bul. Soils 11. May 14, 1952.

This is a discussion of the soils of Connecticut. The author expresses the opinion that even though Connecticut soils are poor naturally they are among the most responsive soils anywhere. When managed properly, including the use of fertilizers, they are very productive. The way they are made up and how they are managed, in addition to climate, accounts for much of this.

SOME PHYSICAL FACTS ABOUT CONNECTICUT SOILS.

By C. L. W. Swanson; Conn. Agr. Expt. Sta.
Special Bul., Soils 10. February 29, 1952.

This is a discussion of the physical properties of Connecticut soils.

A NEW CONCEPT - USING CHEMICALS FOR SOIL STRUCTURE IMPROVEMENT.

By C. L. W. Swanson; Jour. Soil and Water Conservation, Vol. 7, No. 2, pp. 61-67. April 1952.

This is an informative article on the use of Krilium for soil structure improvement. Generally speaking, the use of Krilium in soils high in clay improves the structure, increases their porosity, and permeability, making them easier to work. It also reduces cracking and crusting of the soil surface. Under certain conditions, Krilium can be used to control soil erosion.

RAINDROPS PUDDLE SURFACE SOIL.

By J. H. Stallings; Jour. Soil and Water Conservation, Vol. 7, No. 2, pp. 70-74 and 88. April 1952.

Falling raindrops have great capacity to erode, damage and destroy soils. The sharp impact, as they beat on the naked earth during violent storms, shatters the clods and soil crumbs and breaks down the soil structure. The beating, churning action of these drops compact the soil's finely broken parts into an impervious layer of surface mud to form puddle erosion. This compact-surface layer is made denser and impervious as it strains colloids and other particles from the turbid rain water that filters from the surface into the soil. This compacted surface layer is the most important factor affecting the intake of water by the soil. It decreases infiltration, increases runoff and soil loss, and paves the way for gully formation. Puddle erosion can be prevented by keeping the falling

raindrops from striking the bare soil. This can be done by employing suitable vegetal covers.

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WATER AND TIMBER MANAGEMENT.

By Marvin D. Hoover; Jour. Soil and Water Conservation, Vol. 7, No. 2, pp. 75-78. April 1952.

The water produced by forest land increases in importance as our water needs grow because the bulk of our high water-yielding areas are forested. With an understanding of the relative values involved and good management, water and timber production are compatible. Too often, timber harvesting causes erosion which reduces the quality of water although logging can and should be done so as to avoid damage to the water crop. There are methods for increasing water yields without risking flash floods or water quality but this is possible only on watersheds with good soil conditions. Much of our forest land has been damaged by past agricultural use, grazing, fire, and careless logging. The first watershed need on these areas is improvement of infiltration and water-storage capacity. The forester should recognize the need and the opportunity for better watershed management.

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RECORDING THE INTAKE OF WATER INTO THE SOIL.

By Maurice B. Cox; Jour. Soil and Water Conservation, Vol. 7, No. 2, pp. 79-80. April 1952.

Infiltration of water into the soil with concentric ring infiltrometers has been studied by scientists since the 19th Century. The rate of water entering the soil was obtained by recording both the time and amount of water drawn from a calibrated bottle. This report shows how these measurements can be made with a rain gage.

The instrument consists of the concentric rings, two-carburetor floats, a ten-gallon oil drum, and the recording rain gage. Accurate rates of infiltration were obtained for periods of time as great as sixty hours. A distinct advantage of this equipment is the use of the rain gage for the recording instrument. No altering of the gage is necessary.

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AIR PHOTO INTERPRETATION INVENTORY AND PLANNING.

By Henry W. Dill, Jr.; Jour. Soil and Water Conservation, Vol. 7, No. 2, pp. 81-84. April 1952.

Four main advantages are apparent in the photo-interpretation method for open-land inventory. First, the required data in a usable form can be

obtained with economy of funds and personnel. Second, present land-use inventory and proposed future changes are determined on the same basis. Third, expensive field work is reduced greatly and used where it will do the most good. Fourth, the method provides an estimate of areas not requiring a remedial program; this allows for more careful estimates of extent and costs of remedial measures.

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STUDY OF SEEPAGE LOSSES FROM IRRIGATION CHANNELS.

By A. R. Robinson and Carl Rohwer; Colo. Agr. Expt. Sta. Progress Report for 1951. April 25, 1952.

A study of the seepage rates as shown by seepage rings indicates that the effect of the length of time that water has been in a canal is a very important factor in the determination of seepage losses. Although other factors such as silting and chemical reactions which usually reduce the seepage rate were eliminated in this study, the seepage rates nevertheless continued to decrease from season to season.

"Effect of Depth" tests again demonstrated the fact that the seepage rate is not directly proportional to the depth of water in the canal but that there is still seepage at the time that water reaches zero depth. This phenomenon was utilized in determining the permeability of the soil within the seepage rings.

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CONSERVATION AND CONSUMPTIVE USE OF WATER WITH SUGAR CANE UNDER IRRIGATION IN THE SOUTH COASTAL AREA OF PUERTO RICO.

By D. K. Fuhrman and R. M. Smith; P. R. Agr. Expt. Sta., Jour. of Agriculture of the University of Puerto Rico, Vol. 35, No. 1. January 1951.

Prevailing methods of irrigation in Puerto Rico can be reasonably efficient in the use of water if the systems are carefully laid out and if the irrigators are well trained and conscientious. With the standard, short-run, big-furrow, McLane methods, the greatest losses are caused by applying too much water in one irrigation and by applying water at times when the soil has very little available storage capacity. At its best, the short-furrow method has a high labor requirement and is therefore rather expensive.

Properly designed sprinkler irrigation has shown a consistently high efficiency of about 75 percent.

Major changes in irrigation methods, other than by sprinkling, would require alteration of field

lay-outs, land preparation, cultural operations, and labor practices.

CHEMICALS TAKE OVER COTTON WEEDING.

By F. J. Keilholz; Country Gentleman, Vol. 122, No. 4, pp. 23 and 85-86. April 1952.

New chemicals, tractor-sprayed on cotton fields, are putting an end to expensive hoe labor for weed control. Thousands of test acres were treated in 1951 with pre-emergence and post-emergence types of weed killers. The dinitros are the most important and promising of the pre-emergence chemicals. Application of the pre-emergence chemicals is made simultaneously with planting by a spray boom attached to a sprayer mounted on the tractor with the planter. The spray is applied in 12- to 16-inch bands about 10 inches behind the planter press wheels. The dinitros kill most annual weeds without injury to the cotton. They are not effective against most perennial weeds. Pre-emergence treatment controls weeds in the treated bands for from three to five weeks or longer. Then, post-emergence treatments of oil and/or flame are used as needed the rest of the season.

ESTIMATING THE IRRIGATED SOIL MOISTURE TENSION IN THE ROOT ZONE OF GROWING CROPS.

By Sterling A. Taylor; Soil Sci., Vol. 73, No. 5, pp. 331-339. May 1952.

This paper presents a theory of integrating the soil-moisture tension in the root zone of growing plants.

USE OF DITHIZONE AS AN EXTRACTANT TO ESTIMATE THE ZINC NUTRIENT STATUS OF SOILS.

By Ellsworth Shaw and L. A. Dean; Soil Sci., Vol. 73, No. 5, pp. 341-347. May 1952.

A dithizone extraction procedure to measure available zinc in soils was investigated. Factors affecting the results, such as time of extraction, pH, and mechanical and thermal pretreatment were examined. Optimum conditions were selected, and the test was applied to soil samples representing many different soils from major areas of zinc deficiency. A scatter diagram of the results shows a relationship among soil pH, dithizone-extractable zinc, and the occurrence of plants with zinc-deficiency symptoms. On the basis of these data this procedure may be of value for indicating the zinc status of soils.

ORIGIN OF THE BASE-EXCHANGE CAPACITY OF CLAYS AND SIGNIFICANCE OF ITS UPPER LIMITING VALUE.

By R. P. Mitra and K. S. Rajagopalan; Soil Sci., Vol. 73, No. 5, pp. 349-360. May 1952.

This paper seeks to reveal the nature of this change and define conditions under which the total negative change of the surface will be operative and thus bring out the maximum possible value of the base-exchange or base-combining capacity.

EFFECT OF IRON AND ALUMINUM OXIDES ON THE RELEASE OF CALCIUM AND ON THE CATION-ANION EXCHANGE PROPERTIES OF SOILS.

By A. Mehlich; Soil Sci., Vol. 73, No. 5, pp. 361-374. May 1952.

The effect of type of colloid, including montmorillonite, kaolinite, gibbsite, goethite, and hematite, on the release of Ca with HCl and on the content of cations of cotton and turnip tops was studied. The anion exchanger IR-4B in a mixture with a montmorillonitic soil was studied in some of the experiments. The cation- and anion-exchange capacities of the various systems were determined.

ACCUMULATION OF THE MAJOR BASES AND HEAVY METALS IN FLORIDA CITRUS SOILS IN RELATION TO PHOSPHATE FERTILIZATION.

By Walter Reuther, Paul F. Smith and Alston W. Specht; Soil Sci., Vol. 73, No. 5, pp. 375-381. May 1952.

This paper summarizes the results of total analyses of topsoil samples collected after about 7 years of differential phosphate treatment. These samples were obtained from an experimental orchard and from similar long-term field experiments with pineapple oranges in which the rate of superphosphate fertilization was a major variable. These data are concerned with the accumulation in the soil of applied nutrient contents and its relation to the rate of phosphate fertilization.

LEACHING OF CALCIUM IN A FINE SANDY LOAM AS INDICATED BY Ca⁴⁵.

By James M. Blume; Soil Sci., Vol. 73, No. 5, pp. 383-389. May 1952.

Studies dealing with the movement of calcium in Norfolk fine sandy loam under the influence of severe leaching were carried out in the laboratory with the aid of Ca⁴⁵. The distance calcium

moved from a particular layer was slight, even when the total amount of calcium leached from a soil was appreciable. Apparently, calcium moved down the column by a continuous series of displacements, the calcium appearing in the leachates being that originally present in the lower layers of the soil. The total amount of calcium leached from a heavily fertilized soil was greater when the soil had been fallowed than when cropped, although the distance any particular atom moved was not affected.

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DETERMINATION OF SOIL MOISTURE BY NEUTRON SCATTERING.

By Wilford Gardner and Don Kirkham; Soil Sci., Vol. 73, No. 5, pp. 391-401. May 1952.

This study shows theoretically, and experimentally for five soils, that a method involving the scattering and slowing of fast neutron by hydrogen may be used for measuring soil moisture. The method rests primarily on two considerations. First, hydrogen is, practically the only material that will slow fast neutrons. Second, hydrogen in soils is present almost entirely in the form of water.

In applying the above concepts, a fast-neutron source and a slow-neutron counter are lowered into a small auger hole in the soil. The counting rate of neutrons which have been slowed by soil hydrogen is a measure of the moisture content.

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IONIZATION OF SOILS AND SOIL COLLOIDS: III. POTASSIUM-CALCIUM RELATIONSHIPS IN ILLITE, KAOLINITE, AND HALLOGSITE.

By S. A. Barber and C. E. Marshall; Soil Sci., Vol. 73, No. 5, pp. 403-413. May 1952.

The potassium-calcium relationships of two illites were found by activity measurements to be closely similar to those of Putnam clay (beidellite) in general features. Increase in calcium saturation greatly increased the potassium activity. Potassium lowered the calcium activity up to about 60 percent saturation and beyond this point increased it slightly. Compared with montmorillonite group clays, illites tend to hold potassium more tenaciously but calcium less tenaciously.

The potassium-calcium relationships of kaolinite show qualitative similarities to those of beidellite and the illites, but quantitatively they are distinctly different. Calcium increased the potassium activity, and potassium decreased the calcium activity below 60 percent saturated but increased it slightly beyond this point.

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THE SILTING OF LAKE CALHOUN, GALVA, ILLINOIS.

By J. B. Stall, A. A. Klingebiel, S. W. Melsted, and E. L. Sauer; Ill. State Water Survey Div., SCS, and Ill Agr. Exp. Sta. Report of Investigation No. 15. 1952.

Lake Calhoun, a recreational lake near Galva, Illinois, was constructed in 1924. By 1936 the reservoir had lost 35.7 percent of its original capacity to sediment. By 1947 a total of 73.6 percent of the original capacity had been destroyed by sediment.

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NUMERICAL ANALYSIS OF CONTINUOUS UNSTEADY FLOW IN OPEN CHANNELS.

By Pin-Nam Lin; Trans. Amer. Geophysical Union, Vol. 33, No. 2, pp. 226-234. April 1952.

In this paper is presented a simplified method of solving Massau's equations of characteristics for unsteady flow having a continuous surface profile. This method eliminates much of the trial-and-error process formerly required.

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UNIT-HYDROGRAPH LAG AND PEAK FLOW RELATED TO BASIN CHARACTERISTICS.

By Arnold B. Taylor and Harry E. Schwarze; Trans. Amer. Geo. Union, Vol. 33, No. 2, pp. 235-246. April 1952.

Unit-hydrograph lag and peak-flow values have been empirically related to basin characteristics and to the duration of rainfall excess. Characteristic data for 20 basins ranging from 20 to 1600 sq. mi. of drainage area and located in the North and Middle Atlantic States were used in the study. Unit-hydrograph values were obtained from 65 rainfall excess periods.

The study indicates that the most significant basin characteristics were drainage area, length of longest watercourse, length to center of area, and equivalent main-stream slope. Graphs of the correlation studies are given and a method for determining equivalent main-stream slope is presented. A nomograph for the computation of synthetic unit hydrographs is included and is based on equations developed in the study. The data presented will aid in the determination of unit hydrographs for ungaged watersheds in similar areas.

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IMPROVED ROTARY SIEVE FOR MEASURING STATE AND STABILITY OF DRY SOIL STRUCTURE.

By W. S. Chepil; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 113-117. April 1952.

An improved rotary sieve designed to overcome the limitations of the original sieve (1) was constructed and thoroughly tested.

The improved apparatus is capable of separating dry soil in one operation into any number of dry soil fractions up to 14. The operation requires little technical skill. The results of sieving are independent of personal judgment.

The apparatus was found useful for determining the relative mechanical stability as well as the state of aggregation of soil in a dry condition. Mechanical stability, as determined from the relative resistance of soil aggregates to breakdown by repeated sieving, varied directly with the resistance of the soil aggregates to abrasion by wind-blown soil materials. Abrasion is one of the serious aspects of erosion of soil by wind.

The rate of breakdown of soil aggregates varied exponentially with the number of sievings. Assuming this type of relationship to extend beyond the experimental range, the amounts of some particular size of aggregates present in soils before sieving were estimated.

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ION ACTIVITIES IN SODIUM-CLAY SUSPENSIONS.

By Robert S. Whitney and Michael Peech; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 117-122. April 1952.

A study has been made of dissociation and hydrolysis of Na-clay as a function of the degree of Na⁺ saturation of the clay and the concentration of NaCl in the clay suspension. The activities of Na⁺, H⁺, HCO₃⁻, and Cl⁻ in the clay suspension were measured by the Donnan equilibrium method. From the Donnan distribution of ions between the two phases, it has been possible to apportion the observed Na⁺ activity in the clay suspension to Na⁺ dissociated from the clay and to diffusible sodium salts present in the clay suspension. The activity of Na⁺ dissociated from the clay and the activity of Na⁺ due to the presence of diffusible sodium salts in the clay suspension were both found to increase with the increasing degree of Na⁺ saturation of the clay and increasing concentration of NaCl or Na-clay in the clay suspension. The anomalous increase in the activity of Na⁺ dissociated from the clay with the increasing concentration of NaCl or Na-clay in the suspension may be attributed to the decrease in the thickness of the ionic atmosphere around the clay particle, resulting in greater concentration of osmotically active Na⁺ ions in the outer part of the diffuse double layer.

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CHARACTERISTICS OF SOME PODZOLIC, BROWN FOREST,

AND CHERNOZEM SOILS OF THE NORTHERN PORTION OF THE LAKE STATES.

By Iver J. Nygard, P. R. McMiller, and Francis D. Hole; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 123-129. April 1952.

The morphology of the six great soil groups - Chernozem, Degraded Chernozem, Gray Wooded, Brown Forest, Brown Podzolic, and Podzol - with laboratory data is presented.

The general distribution of these soils is shown on a schematic map. Of the five soil forming factors, three - climate, living matter, and parent materials - change notably from west to east. The other factors, topography and age, are reasonably uniform in the areas selected for the model soil profiles. Additional maps, illustrations of soil profiles, and related landscapes accompany the article. Tables of profile characteristics and laboratory analyses are arranged to show a summarized comparison of the various soil horizons of each soil.

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GRAY WOODED SOILS IN PARTS OF ALBERTA AND MONTANA.

By B. H. Williams and W. Earl Bowser; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 130-133. April 1952.

Recent field correlations, laboratory study, and a review of the literature on forested soils of the Northern Great Plains and contiguous mountainous areas and areas east of the plains indicate a need for pointing up the relationships among the several groups of podzolic soils of this region. To attain this objective the attention of the authors was focused on the analyses of field observations, field notes, and laboratory data pertaining to selected samples of Gray Wooded soils and some associated soils in Alberta and Montana. Differences and similarities among Gray Wooded soils and how they differ from the associated soils and from Podzol soils in eastern United States and Canada are brought out graphically and in discussion. Particular stress is placed on the climatic environment, natural vegetation, and parent materials that seem to account for the unique properties of these soils. Representative profiles of three Gray Wooded soils are described in detail.

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THE EFFECT OF HUMUS ON CATIONIC INTERACTIONS IN A BEIDELLITE CLAY.

By E. O. McLean; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 134-137. April 1952.

Previous studies of cationic interactions have been made for the most part using relatively

pure clay minerals. This has been a logical place to start, but to be of maximum practical benefit in solving agronomic problems sooner or later the resulting principles must be projected back to the natural soils. Too little is known about the relationship between ionic activities in plant media and nutrient uptake. But certainly one would not expect close correlation between these activities in pure clay and nutrient uptake from a soil high in this particular clay mineral unless there were no other substances present which possess exchange properties capable of interfering with activities and interactions caused by the clay mineral. In this connection it is obvious that the effect of humus on the cationic activities and their interrelationships is of utmost importance.

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ZONAL SOILS IN THE TRANSITION REGION BETWEEN THE PODZOL AND GRAY-BROWN PODZOLIC REGIONS IN MICHIGAN.

By D. R. Gardner and E. P. Whiteside; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 137-141. April 1952.

Studies were made of soil profiles from an area in central Michigan lying along the Podzol-Gray-Brown Podzolic transition region. The profiles are grouped in a lithosequence of seven textures from sand to silty clay loam and reproduced photographically. Selected physical and chemical analyses from three of the seven textures are presented tabularly.

Through the range of textures studied, these profiles possess a common sequence of horizons. While the surface horizons are clearly those of a Podzol, they are underlain by what appear to be the A_2 and B_2 of a Gray-Brown Podzolic profile. The influence of the texture of parent material is such that, in the sandier types, the upper Podzol is much more strongly developed than is the lower Gray-Brown Podzolic profile while in the heavier textures, the reverse is true.

The authors conclude that these double profiles represent the zonal soil for this area and are correlatives of the double profiles described by other workers in New York and in Ontario. These soils are neither true Podzols nor true Gray-Brown Podzolic soils but exhibit the characteristics of both groups, the affinity for one or the other being related to the texture of the parent materials.

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THE EFFECT OF SULFUR OXIDATION ON THE AVAILABILITY OF MANGANESE.

By Joseph P. Vavra and Lloyd R. Frederick; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp.

141-144. April 1952.

The purpose of this investigation was to determine the effect of bacterial oxidation of sulfur upon the release of soluble manganese from manganese dioxide. Using the soil perfusion technique it was found that the oxidation of elemental sulfur or sodium thiosulfate applied to soil resulted in a release of soluble manganese accompanied by a lowering of pH. Addition of calcium carbonate caused a decrease in the amount of soluble manganese released, although the amount of sulfate formed was not changed significantly. In pure culture studies on synthetic media, 10 times more soluble manganese was found when sulfur was oxidized by *Thiobacillus thiooxidans* than when the same acidity was produced by the addition of sulfuric acid. Separation of the MnO_2 from the sulfur and the bacteria by a collodion membrane did not prevent the reduction of manganese.

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SOME THEORETICAL ASPECTS OF THE FLOW OF WATER IN UNSATURATED SOILS.

By A. Klute; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 144-148. April 1952.

The validity of Darcy's law in unsaturated media and the assumptions made in its use are discussed. The relationship of the permeability coefficient in Darcy's law to various soil parameters is briefly considered, the total soil-moisture potential is defined, and its components discussed. By use of the equation of continuity and Darcy's law, an equation of flow is derived, and the general problem of obtaining solutions of this equation is outlined. The special mathematical difficulties encountered when the permeability is considered as a function of the moisture content or the capillary potential are also indicated. A numerical solution of the flow equation for a semi-infinite system is given, using a functional relationship between the permeability and the moisture content, and the phenomenon of a wetting front is shown to be indicated.

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DEPTH TO PLOW PAN AS A FACTOR IN SUGAR CANE PRODUCTION.

By C. E. Scarsbrook, Jack D. DeMent, and M. B. Sturgis; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 148-150. April 1952.

Results from fertilizer studies in the sugarcane growing areas of Louisiana have shown no consistent relationship between native soil fertility as determined by soil tests and yields of sugar cane. In many cases there have been very low responses to the fertilizers. This investigation was made to determine what soil factors

were related to yields. Measurements of depth to plow pan, aggregation, organic matter, soluble phosphorus, and exchangeable cations were made on check plots and plots receiving the highest rate of fertilizer.

Depth to plow pan was directly related to yield on unfertilized plots. There appeared to be a trend toward greater increases in yield due to added fertilizer as the depth to the plow pan decreased. Except in extreme cases other factors measured had less effect on yields.

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A THEORY ON THE SOIL ATMOSPHERE IN AND AROUND A HEMISPHERE IN WHICH SOIL GASES ARE USED OR RELEASED.

By C. H. M. van Bavel; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 150-153. April 1952.

If the root system of a plant is taken as approximately hemispherical it is of interest to compute the distribution of partial pressures of soil gases. This can be done by assuming that these gases are taken up, or released, at a constant rate throughout the hemisphere and also that the physical condition of the soil with regard to diffusion is uniform.

Inside the hemisphere the solution is a simple algebraic expression and outside it is an infinite series containing Legendre's polynomials. In addition to the exact formulas the solution is given in the form of a computed graph, which may be used to calculate actual values of partial pressure at any point in the soil, if the necessary constants are known. It appears that the extreme values of partial pressure are closely centered around the apex of the hemisphere.

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THE EFFECTS OF FERTILIZER APPLICATIONS ON THE YIELDS AND NODULATION OF TROPICAL KUDZU.

By George Samuels and Pablo Landrau, Jr.; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 154-155. April 1952.

In view of the reported good growth of tropical kudzu, *Pueraria phaseoloides javanica*, in acid soils (pH 5.5 and below) and the use of nitrogen fertilizers to establish kudzu stand, this study was initiated to determine the effects of liming and nitrogen on yields and nodulation.

The tropical kudzu was grown in the greenhouse on Lares clay, an acid lateritic clay with a pH of 4.4. The treatments consisted of a control, nitrogen (1,200 pounds of ammonium sulfate), calcium (10,000 pounds of CaCO_3), nitrogen plus calcium, and borax (30 pounds) plus calcium. All treatments received P_2O_5 and K_2O at a rate of 100 pounds each per acre. The kudzu was

harvested at a crop age of 3 months.

The use of nitrogen increased yields significantly over the control with no nitrogen, but the number of nodules per plant decreased very significantly from 59 nodules per plant to 10 nodules per plant. The lime treatment gave higher yields than the control, but not as high as the nitrogen treatment; the number of nodules per plant, however, was highest for the lime treatment. The use of lime and nitrogen in combination gave the highest yields, but the number of nodules per plant was reduced to the same as the treatment with nitrogen only. Lime and borax together gave high yields, parallel to the nitrogen treatment, but the number of nodules per plant was the lowest obtained for any treatment. The nitrogen content showed no statistically significant difference for any treatment.

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FURTHER STUDIES ON THE EFFECT OF LONG-TIME ORGANIC MATTER ADDITIONS ON THE PHYSICAL PROPERTIES OF SASSAFRAS SILT LOAM.

By M. B. Russell, A. Klute, and W. C. Jacob; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 156-159. April 1952.

The objectives of the investigation were to determine the effects of long-time differential manure applications on physical properties, organic matter, and nitrogen content; to provide a "bench-mark" for future studies on the permanence of the observed differences following the discontinuance of the treatments; and to study the distribution of variance among the experimental, sampling, and determination error terms as a guide for planning future studies involving the same plots and measurements.

Composited soil samples were taken at three depths from plots representing three replications of each of four treatments. Organic carbon, total nitrogen, moisture equivalent, 15-atmosphere percentage, aggregate stability, and percent sand were determined on all samples. Processor compaction and penetrability measurements also were made.

Twenty-five annual applications of manure at rates of 0, 10, 20, and 40 tons per acre have resulted in highly significant differences in organic carbon and nitrogen percentages, aggregate stability, and susceptibility to compaction of Sassafras silt loam. Highly significant positive correlation coefficients were obtained between the organic-matter content and the moisture equivalent, 15-atmosphere percentage, and aggregate stability. Sampling and determination variances were in general well below the corresponding experimental variances.

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THE MEASUREMENT OF OXYGEN DIFFUSION IN THE SOIL WITH A PLATINUM MICROELECTRODE.

By E. R. Lemon and A. E. Erickson; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 160-163. April 1952.

The current obtained in the electrolysis of an electro-reducible material, as oxygen, at the surface of a platinum electrode can be used to calculate the rate of diffusion of that material to the surface. Measurements made in the soil, based on this principle, give promise of furnishing a new, simple, rapid, and inexpensive method of determining the rate of oxygen supply to an undisturbed environment similar to that in the liquid film surrounding an actively respiring plant root. The method compared favorably with other methods for measuring soil aeration in a greenhouse experiment.

Evidence presented indicates that factors controlling the diffusion rate in the gaseous phase of the soil extend into the liquid phase as well. The data show greater oxygen diffusion rates with larger aggregates and greater soil porosity. The rates decreased with increasing depth below the soil surface. At the lower porosities moisture film thickness has a greater effect on oxygen supply than at the higher porosities.

Growth of tomatoes correlates well with oxygen diffusion measurements made with the micro-electrode, and a critical rate is suggested for their growth.

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DOMINANT SOILS OF THE REDWOOD - DOUGLAS-FIR REGION OF CALIFORNIA.

By R. Earl Storie and A. E. Wieslander; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 163-167. April 1952.

More than three million acres of the upland area of the Redwood-Douglas-fir Region of California have been mapped and classified to obtain information for use in the management of forest, grazing, and watershed land, as well as basic data on the soils of this important area. In this survey the soils have been classified as to soil series and depth classes.

The dominant soil series are divided into six groups according to association with natural vegetation cover and productivity for timber and grass. Groups 1 and 2 are associated with conifer timber forests; groups 3 and 4 with grass and oak-grass types; and groups 5 and 6 with chaparral. Group 1, the best for timber, includes soils of podzolic character, represented by such series as the Hugo and Josephine; Group 2, those of alkaline character, represented by the Cornutt and Dubakella series; Group 3, the best for grass, those classed as prairie soils,

generally treeless and associated with perennial grasses and represented by the Los Osos and Kneeland series; Group 4, those classes as non-calcic brown, associated with annual grasses and open stands of oaks, and represented by the Laughlin series; Group 5, lithosols of low site quality for grass and represented by the Los Gat-os series; and Group 6, lithosols of very low site quality for grass and represented by the Maymen and Henneke series.

Data from profiles typical of the six groups of soils are presented showing soil characteristics, vegetational cover, and ratings of suitability for timber and for grass. These data point out that timber does best on medium textured deep (more than 4 feet to bedrock), permeable, well-drained soils where the annual rainfall exceeds 40 inches; that grass, in contrast, does best on finer textured, less permeable, and less well-drained - although shallower soils (between 2 and 3 feet deep) - which are typically less acid or more basic with depth; and that chaparral can grow on very shallow soils (less than 1 foot deep).

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CHROMATOGRAPHIC SEPARATIONS OF INOSITOL PHOSPHORUS COMPOUNDS.

By Donald H. Smith and Francis E. Clark; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 170-172. April 1952.

A chromatographic technique for the separation of sodium phytate and its enzymatically produced derivatives is described. From a mixture of sodium phytate and derivatives, nine organic phosphorus compounds were separated in sufficient quantities to permit determination of their inositol/phosphorus ratios. Phosphorus was determined colorimetrically following perchloric acid digestion, and inositol was determined by means of a biological assay. The determinations were replicated sufficiently that the number of phosphorus atoms per molecule of inositol was considered to have been determined to within one atom of the true value in all cases. The identity of the nine separated compounds was tentatively established.

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EVALUATION OF CERTAIN FACTORS INVOLVED IN INCREASING MANGANESE AVAILABILITY WITH SULFUR.

By C. L. Garey and S. A. Barber; Soil Sci. Soc. Amer. Proc., Vol. 16, No. 2, pp. 173-175. April 1952.

Manganese deficiency on certain Indiana soils may be corrected by adding sulfur. When elemental sulfur is added to the soil, three important changes take place: an oxidation-reduction reaction, an increase in the sulfate ion concentration

and a pH change. The purpose of this investigation was to determine the importance of each of these factors in increasing manganese availability. Chemicals which would theoretically produce these three actions singly and in all possible combinations were added in equivalent amounts to a Maumee sandy loam soil having pH levels of 6.0, 6.5, and 7.5. This soil had previously shown severe manganese deficiency at the two higher pH levels. The chemicals used were elemental sulfur, sulfuric acid, hydrochloric acid, sodium thiosulfate, sugar, magnesium sulfate, and ammonium chloride. Soybeans were grown as the indicator crop.

Relationship between the yield and manganese content of the soybeans and the treatments were obtained under these conditions. The treatments including sulfur oxidation gave yields and manganese contents above that which could be attributed to pH change. Treatments causing a pH change benefited the crop in proportion to the pH change. The presence of sulfate alone gave no effect.

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FACTORS AFFECTING THE INTERLAYER EXPANSION OF VERMICULITE AND MONTMORILLONITE WITH ORGANIC SUBSTANCES.

By Isaac Barshad; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 176-182. April 1952.

An evaluation of the factors affecting interlayer expansion of the mica type layered minerals was made by X-raying various dehydrated forms of montmorillonite and vermiculite while immersed in liquids of varying dipole moments and dielectric constants. The results showed that the extent of interlayer expansion was determined by the size, charge, and total amount of the interlayer cations and by the magnitude of the dipole moment and the dielectric constant of the immersion liquid. The results were explained on the basis of the nature of the electrostatic interlayer attractive forces within the crystal lattice itself and by the laws governing complex formation between charged particles.

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YIELD AND QUALITY OF PEAS FOR PROCESSING AS AFFECTED BY LIME AND FERTILIZERS.

By G. L. Terman and H. J. Murphy; Soil Sci. Soc. Amer. Proc., Vol. 16, No. 2, pp. 182-185. April 1952.

In order to obtain information which might improve yields, lime and fertilizer tests on peas for canning and freezing were conducted in Aroostook County and central Maine over a 4-year period, 1947-1950.

Applying 300-400 pounds of finely ground dolomitic limestone down the drill spout with the pea seed increased the yield of shelled peas on the average by 645 pounds per acre on acid potato soils. With properly inoculated seed lime applications prevented premature yellowing of the vines and resulted in normal dark green growth of vines without nitrogen fertilization of the crop.

Where lime was applied with inoculated seed, application of N or NPK fertilizers resulted in increases in yields of shelled peas of low tenderometer ratings and high quality in only 4 out of 16 experiments. Yields of vines, however, were increased consistently by N fertilization; in most experiments yields of shelled peas of high tenderometer ratings and low quality were also increased. With peas harvested on the same day both lime and nitrogen tended to delay maturity, as shown by lower tenderometer ratings.

Since lime and nitrogen have similar effects on yields of peas grown on acid soils, it may be concluded from this study that application of lower costing lime with inoculated pea seed is more profitable than higher costing nitrogen fertilization. Application of nitrogen can usually be justified only to delay maturity of part or all of the crop to facilitate harvesting a high quality pack. Application of P and K fertilizers is recommended only as insurance on soils testing low in these nutrients.

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THE EFFECT OF CALCIUM ON THE GROWTH OF SOYBEANS SUPPLIED WITH AMMONIUM NITROGEN.

By J. J. Siegel, H. W. Hough, and L. M. Turk; Soil Sci. Soc. Amer. Proc., Vol. 16, No. 2, pp. 185-188. April 1952.

Nitrification was inhibited in soils treated with fumigants, resulting in the accumulation of ammonium. A study was made of the effects of this reduced form of nitrogen on the growth of soybeans. Soybeans were grown in sterile nutrient cultures and were supplied nitrogen in the form of nitrate, ammonium, or amino acids at varying levels of calcium.

The plants receiving ammonium had a higher content of protein and matured earlier but did not produce as much vegetative growth. High calcium levels in the nutrient solution resulted in the best plant growth where the source of nitrogen was ammonium. The total mineral cation uptake was lower in the ammonium-supplied plants than in those supplied with nitrate indicating that ammonium enters into the cation balance.

Soybeans grown on soils fumigated with Dowfumes N, W-40, and MC-2 responded favorably to high levels of calcium. The plants grew rapidly and had a high protein content although the total

mineral cation uptake was less than that of the untreated soils. A high level of calcium is necessary where ammonium is the source of nitrogen.

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EFFECTS OF LEGUMES IN DIFFERENT CROPPING SYSTEMS ON YIELD OF CORN.

By E. B. Reynolds and M. J. Norris; Soil Sci. Soc. Proc., Vol. 16, No. 2, p. 189. April 1952.

There were no significant differences in the yields of corn in 1950 at College Station where corn followed cotton which was preceded immediately by hairy vetch, Willamette vetch, Austrian Winter peas, Dixie Wonder peas, and Singletary peas plowed under for soil improvement. The application of 60 pounds of nitrogen per acre to the corn, however, produced a highly significant increase in the yield of corn.

Of the four legumes and six cropping systems included in the work at Denton, only Hubam and Madrid sweetclovers produced significant increases in the yield of corn in 1950. Corn after Hubam sweetclover for green manure produced only 2 bushels per acre more than corn following Hubam sweetclover for seed. Austrian Winter peas and Dixie Wonder peas did not increase the yield of corn, probably because they made very little growth.

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MULCH TILLAGE: SOME EFFECTS ON PLANT AND SOIL PROPERTIES.

By J. E. Moody, J. H. Lillard, and T. W. Edminster; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 190-194. April 1952.

The effects of a "double-cut plow" method of mulch tillage on fertility, as measured by soil nitrate-N, soluble nutrients in leaf, grain yields, and nutrient content of the corn plant, and on physical properties of the soil were investigated at Blacksburg, Va. The standard 3-year rotation of corn, small grain, and clover-grass with mulch tillage practice during the corn year was compared with a similar rotation using conventional clean tillage practice.

The percentage of N in the corn plant was lower where mulch tillage was used. The differences were significant (5 percent level) for high yield seasons. Percentage P in the plant was not affected by tillage method. Differences in K content of corn plant between tillage method, although usually large, were inconsistent. In general, soil nitrate-N and soluble N-P-K in leaf tissue were lower during the early part of the growing season under mulch tillage.

Significant reduction in yields (19 bu./A.) were

obtained from mulch in 1948. This was apparently due to a similar reduction in stand. In 1949 and 1950, with planter modifications which pushed the mulch from the row, comparable yields and stands were obtained. Three-year average yields were: mulch 73 bu./A., turn plow 81 bu./A.

The 0-3 inch layer of soil under mulch showed higher aggregation, air space, percent organic matter, and percent total nitrogen than did conventional tillage.

There are a number of factors which may affect the availability of nutrients where this tillage method is used. It is believed that the lower N status under mulch was due chiefly to changes in the soil microflora brought about by this tillage.

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MICROCLIMATE AND WATER VAPOR EXCHANGE AT THE SOIL SURFACE.

By Hans Brawand and Helmut Kohnke; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 195-198. April 1952.

Estimates were obtained on the annual water vapor exchange through adsorption, condensation, and evaporation at the ground surface under field conditions. The investigation was coordinated with measurements of environmental microclimatic conditions. For a 2-month period data were obtained also on nocturnal water accretions on corn and soybean leaves.

A small area of land on the Purdue University dairy farm near West Lafayette, Ind., was chosen as site for the field experiments. Five sampling conditions were employed, in which 20 small metal dishes served as containers for various soil and water samples. Each sampling set consisted of four filled dishes, two of the dishes to be placed on the ground surface of bare soil and the other two on meadow, during experimental periods.

The annual moisture gains from adsorption and condensation of atmospheric water vapor are estimated at 1.22 inches for bare soil, and 0.99 inch for soil having grass-clover vegetation. The water vapor transfer from the subsoil to the soil surface, not including evaporational losses, attained 1.34 inches of water on bare ground and 0.77 inch on meadow. This results in total moisture gains of 2.56 inches and 1.76 inches, respectively. The field tests indicated that 0.59 inch of water per month per acre of ground collected on corn leaves in summer. Similarly, soybeans yielded 1.32 inches in the same period. This accumulated moisture on the plant leaves in clear nights consists of condensational water from the atmosphere and of guttation.

Water vapor transfer from the subsoil toward the top layer normally remains confined to night hours during the period from March to October. Under the same conditions, a two-directional moisture loss from the ground surface layer takes place in the daytime: a part of the moisture can be driven to greater soil depths, while perhaps a larger part is subject to evaporation. Water vapor transfer from the subsoil to the surface may be a continuous process in winter, unless the soil is water saturated.

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EFFECT OF FUMIGATION ON SOIL AGGREGATION.

By J. P. Martin and D. G. Aldrich; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 201-203. April 1952.

A study was made of the effects of several soil fumigants in moderate and high dosages and of steam sterilization on the aggregation of the $\approx 50 \mu$ particles of five soils. The fumigants were injected into dry soil in large screw cap bottles, water sufficient to bring the moisture content of the soil to 50 percent of capacity was immediately added, and the lids tightly secured. After 3 days the soil was air-dried, placed in 16-ounce jars in 420-gram portions, adjusted to 50 percent moisture capacity, and incubated. Microbial counts and aggregate analyses were made after 0-, 10-, 20-, 50-, 100-, and 250-day incubation periods.

The fumigation treatments markedly affected the microbial population of the soils but had little or no effect on aggregation. In high dosages, D-D, chloropicrin, and ethylene dibromide slightly increased the aggregation of one soil, namely, Yolo loam at the 0-day incubation period only. Steam sterilization increased the aggregation of Yolo loam, an unnamed mountain soil, and Hanford sandy loam. In the latter two soils, the effect was not significant after the 0-day incubation period. Increased aggregation was associated with decreased wettability of the soil.

The study indicates that aggregation is influenced more by products of microbial activity during the decomposition of organic waste material than by numbers of microorganisms. Fumigation apparently does not provide sufficient energy material in the form of dead microbial cells and adsorbed fumigant to change the aggregation status of a normal soil significantly, or destruction of organic-cementing materials by increased microbial activity counteracts any aggregating effect.

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CHARACTERISTICS OF SOME BROWN PODZOLIC PROFILES IN THE CENTRAL LOWLAND OF CONNECTICUT AND MASSACHUSETTS.

By C. L. W. Swanson, A. E. Shearin, and G. A. Bourbeau; Soil Sci. Soc. of Amer. Proc., Vol. 16, No. 2, pp. 203-207. April 1952.

Field and laboratory data are presented on six representative Brown Podzolic soils occurring in the Cental Lowland of Connecticut and Massachusetts. The environment of this area has been cited as producing modal Brown Podzolic soils. The soils studied have only a few faintly expressed Bleicherde or none at all and no visual evidence of an orterde. Little textural profile development was found in these soils. The pH, organic content, and morphology of the profile may be considered characteristic of Brown Podzolic soils. It is postulated that the high silt content in the solum of some of the soils studied is of eolian origin since so little weathering has taken place as indicated by the low clay content and near absence of colloid accumulation in the B horizon. X-ray diffraction patterns show illite to be the predominant clay mineral in the Merrimac and Wethersfield soils studied. Chlorite montmorillonite, gibbsite, and kaolinite occur in decreasing order of abundance.

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THE DECOMPOSITION OF PARTRIDGE PEA AND ITS INFLUENCE ON NITRIFICATION.

By Juan Colom and T. M. McCalla; Soil Sci. Soc. Amer. Proc., Vol. 16, No. 2, pp. 208-210. April 1952.

Comparative decomposition rates of alfalfa, wheat straw, and whole partridge pea, or its various plant parts taken separately, were determined by measuring weight losses during laboratory incubations. Effects of these plant materials on nitrification rates in soil were also determined.

The alfalfa lost the most weight by decomposition during a 32-week period. The loss in weight of straw also exceeded that of the whole plant of partridge pea. The nitrification rate with partridge pea added was lower than that with untreated soil. Partridge pea leaves increased nitrification, but the pods or stalks decreased it.

The nitrate content of field plots previously grown to partridge pea was higher than that of plots without a legume, but not as high as in plots previously in sweet clover.

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AUTHOR INDEX

Page		Page	
Aglibut, A. P.	12	Brawand, H.	70
Ahlgren, H. L.	33	Bray, C. E.	42
Albertson, M. L.	44, 49	Bray, R. H.	38, 40
Alderman, G.	32	Breen, A. V.	34
Aldrich, D. G.	44, 71	Bremner, J. M.	28
Allaway, W. H.	18	Brill, G. D.	36
Allen, N. H.	33	Broadbent, F. E.	5, 21
Allis, J. A.	36	Broadfoot, W. M.	9, 36
Allison, F. E.	12	Brown, C. B.	41
Allred, B. W.	22, 59	Brown, E.M.	35
Anderson, H. O.	10, 11, 27	Brown, P. L.	51
Anderson, M. A.	42	Buchanan, M. L.	20
Anderson, W. J.	16	Buie, T. S.	29
Anderson, W. L.	24	Burback, H. J.	57
Arnold, J. F.	15	Burbank, H. J.	19
Aronovici, V. S.	23, 54	Burger, O. J.	34
Atkinson, H. B.	26	Burton, G. W.	50
Atkinson, H. J.	58	Burton, J. C.	34
Atmiger, W. H.	34		
Attaya, J. S.	21	Caldwell, A. C.	38
Axley, J. H.	8, 47	Campbell, J. A.	35
Ayers, A. D.	12	Campbell, R. B.	12
Ayers, H. D.	13	Campbell, R. C.	36
		Carleton, W. M.	50
Babcock, K. L.	34	Carpenter, R. W.	51
Bailey, R. W.	20	Carroll, J. C.	34
Bailey, R. Y.	20, 23	Carreker, J. R.	45
Baird, G. T.	57	Carter, O. R.	8
Baker, G. O.	60	Case, H. C. M.	29
Baker, C. J. L.	32	Chaiken, L. E.	17
Barber, E. L.	22	Chandler, W. V.	37
Barber, S. A.	34, 38, 64, 68	Chapin, W. E.	9
Barshad, I.	38, 69	Chapline, W. R.	16
Bartholomew, W. V.	51	Chapman, C. J.	28, 49
Beacher, R. L.	48	Chase, A.	10
Bear, F. E.	28, 40, 47	Cheng, K. Lu.	40
Beasley, R. P.	17	Chepil, W. S.	2, 37, 38, 64
Beauchamp, K. H.	51	Christensen, P. D.	15
Beeson, K. C.	23, 37	Clark, F. E.	1, 68
Berger, K. C.	5, 24, 26	Clark, R. T.	16
Bill, F. W.	42	Clarke, G. R.	28
Billard, J.	42	Clegg, H.	57
Black, C. A.	12, 43	Colby, W. G.	18
Blair, B. C.	57	Coldwell, B. B.	50
Blaisdell, F. W.	22	Coldwell, T.	16
Blaisdell, J. P.	16	Coleman, O. T.	28
Blaney, H. F.	26, 38, 54	Coles, L. W.	29
Blee, C. E.	26	Collier, B. L.	8
Bloodgood, D. W.	11	Collier, J. W.	15, 21
Bloodworth, M. E.	38	Colom, J.	71
Blosser, R. H.	27	Colwell, W. E.	24, 26
Blume, J. M.	56, 60, 63	Connor, C. L.	60
Bolin, D. W.	20	Conrad, J.P.	24, 26
Bonnen, C. A.	49	Cook, C. W.	9, 19, 29, 33
Bosazza, V. L.	54	Cook, E. D.	56
Bourbeau, G. A.	71	Copeland, O. L.	39
Bouyoucos, G. J.	9	Corey, G.	60
Bowers, C. E.	22	Corey, R. B.	1
Bowman, J. S.	26	Corley, T. E.	51
Bowser, C. W.	27, 55	Cox, M. B.	10, 26, 62
Bowser, W. E.	65	Crabb, G. A.	59, 60
Bradfield, R.	12, 47	Craya, A.	48
Brage, B. L.	38	Criddle, W. D.	27, 53

Croft, A. R.	20	Fujimoto, G.	8
Dalton, J. D.	51	Gaines, E. M.	36
Daniel, H. A.	10, 23, 24, 50	Gaiser, R. H.	12
Davis, F. L.	8	Gaiser, R. N.	5
Davis, J. B.	16	Gardner, D. R.	66
Davis, L. E.	34	Gardner, J. L.	24
Davis, R. R.	52	Gardner, W.	18, 64
Davis, S.	44	Gardner, W. H.	18
Davis, W. C.	23	Garey, C. L.	68
Day, P. R.	6	Garton, J. E.	35
Dayton, W. A.	35	Gauch, H. G.	34
DeLong, W. A.	50	Gaufin, D. M.	57
DeMent, J. D.	66	Gibson, D. R.	13, 14
Devane, E. H.	50	Giesecking, J. E.	1
Dean, L. A.	59, 63	Glymph, L. M.	22
Deitschman, G. H.	61	Goodding, T. H.	25
Denuyl, D.	17	Goodman, L. J.	50
Dible, W. T.	5	Goring, C. A. I.	1
Diebold, C. H.	36	Graul, E. J.	33
Dill, H. W.	62	Green, R. L.	39
Doetsch, J. H.	12	Grigsby, B. H.	31
Dole, M. W.	44	Gross, H. M.	47
Donnan, W. W.	23, 27		
Donnelly, C. A.	22	Haas, H. J.	51
Doran, C. W.	20	Hafenrichter, A. L.	9, 10
Drake, M.	18, 24, 26	Hamilton, R. D.	14
Dreibelbis, F. R.	55	Hammond, G. H.	58
Drow, J. T.	22	Hanks, R. J.	4
Dyal, R. S.	4, 33	Hanna, G. B.	50
		Hansen, C. M.	32
Erakin, J. H.	17	Hanway, J.	9
Eck, H. V.	51	Harris, G. A.	58
Eden, A.	32	Harris, H. C.	60
Edgington, G.	34	Harris, L. E.	33
Edminster, F. C.	24	Harrold, L. L.	55
Edminster, T. W.	70	Hauge, S. M.	34
Edson, C. G.	8	Haupt, H. F.	39
Einspahr, D.	18	Hay, R. C.	27
Elder, W. R.	36	Hays, O. E.	10, 25, 26
Ellis, N. R.	16	Heard, W. L.	41
Ellison, L.	15, 20	Hedrick, D. W.	10
Elwell, H. M.	10, 26	Henderson, D. W.	12
Englehorn, C. L.	2, 3	Henderson, S. M.	39
Erickson, A. E.	68	Hendricks, S. B.	4
Evanko, A. B.	16, 58	Hendrickson, B. H.	45
Evans, C. E.	51	Hendrix, T. M.	49
Evans, E. J.	1	Heneberry, W. H.	21
Evans, P. W.	13	Hervey, D. F.	20
		Heuvel, R. C. V.	1
Faris, P. O'N.	30	Hill, K. W.	32
Fenley, J. M.	15	Hines, L. G.	41
Ferris, H. J.	59	Hiltfold, A. E.	51
Fields, M.	13	Hoag, D. G.	20
Firth, D. H.	32	Hodges, E. M.	30
Fleming, W. E.	29	Hodson, E. A.	28
Folse, C. L.	21	Hofford, H. M.	28
Ford, K. D.	20	Hogue, L. E.	13
Foster, A. C.	18	Hole, F. D.	65
Frederick, L. R.	66	Holmes, W.	14
Fried, M.	59	Holmgren, G. G.	6
Fritz, E.	39	Holt, E. C.	30
Fry, A. S.	26	Holtan, H. N.	26
Fuhriman, D. K.	62	Hood, S. L.	60

	<u>Page</u>		<u>Page</u>
Hoover, M. D.	62	Langford, K. R.	59
Howe, H. E.	46	Larson, B. O.	27
Hough, H. W.	69	Laudencia, P. N.	12
Houston, C. E.	27	Law, A. G.	9
Hoyert, J. H.	47	Lehane, J. J.	43
Hseung, Y.	1	Lehr, J. J.	19
Hubbell, D. S.	25	Lemmon, P. E.	10
Hudson, H. E.	41	Lemon, E. R.	68
Hughes, C. P.	32	Libbie, J.	19
Hughes, W. F.	49	Libby, J. A.	57
Hull, A. C.	16, 20	Lillard, J. H.	70
Hull, H. H.	42	Lin, P.	64
Ibach, D. B.	24, 26	Linstrom, G. A.	61
Israelen, O. W.	22	Litz, G. M.	23
		Longenecker, D.	48
		Lowe, D. M.	60
Jackman, R. H.	12, 43	Ludwig, H. F.	51
Jackson, M. L.	1	Lull, H. W.	15
Jacob, W. C.	67	Lusk, T. W.	9
Jacobson, P.	35	Lyerly, P. J.	15
Jamison, V. C.	2, 37, 51		
Janes, B. E.	30	Mac Donald, H. A.	37
Joffe, J. S.	49	Mac Donald, M. A.	40
Johnson, D. D.	5	Mac Intire, W. H.	60
Johnson, E. A.	45	Mac Vicar, R. M.	13, 14
Johnson, E. W.	18	McArthur, W. C.	49
Johnson, L.	25	McAuliffe, C.	12
Johnston, C. N.	10	McCalla, T. M.	25, 71
Johnston, J. R.	15, 22	McComb, A. L.	18
Johnston, P. E.	61	McHard, D.	42
Jones, D. W.	30	McIlvain, E. H.	24, 49
Jones, L. W.	51	McKenzie, R. E.	35
Jones, M. D.	42	McLean, E. O.	34, 65
Jones, W. M.	10	McMiller, P. R.	65
Jordon, J.	60	McNall, P. E.	10, 11, 27
Kapp, L. C.	19, 30	Madson, B. A.	10
Keilholz, F. J.	63	Magee, A. C.	49
Kidder, E. H.	44	Magee, A. I.	33
King, P. J. T.	13	Maierhofer, C. R.	35
Kird, W. G.	30	Maines, W. W.	29
Kirkham, D.	7, 64	Maletic, J. T.	27, 29, 30, 31
Kirkpatrick, M. H.	26	Markham, B. S.	57
Klemme, A. W.	56	Marks, J. D.	6
Klingebiel, A. A.	5, 6, 27, 52, 64	Marshall, C. E.	34, 38, 64
Klipple, G. E.	40	Martin, I. L.	33
Klosterman, E. W.	20	Martin, J. P.	44, 71
Klostermann, H. J.	20	Martin, W. P.	6, 21
Klute, A.	43, 66, 67	Matson, H.	11
Knight, R.	60	Maughan, J. H.	22
Kohnke, H.	19, 70	May, R. M.	24
Kolisch, M.	34	Mech, S. J.	60
Koogler, J. G.	55	Mehlich, A.	63
Kopitke, J. C.	59	Melsted, S. W.	27, 38, 52, 64
Kozachyn, J.	59	Merig, R. W.	12
Krall, J. L.	51	Merkle, F. G.	48
Kramer, P. J.	45	Merriam, C. F.	8
Krantz, B. A.	37	Merrill, L. B.	56
Krick, I. P.	54	Merrill, L. P.	11
Krone, R. B.	51	Metz, L. J.	3
Kurtz, T.	38	Meyer, T. A.	47
		Mihara, Y.	46
Lagrone, W. F.	24	Miller, H. F.	30
Landrau, P.	67	Miller, M. D.	17

	<u>Page</u>		<u>Page</u>
Miller, R. D.	3, 34	Reynolds, E. B.	70
Mitchell, G. A.	51	Rhoades, H. F.	18
Mitra, R. P.	63	Rich, C. I.	4
Moncrief, J. B.	23	Rich, L. R.	54
Moran, C. H.	25	Richard, F.	3
Moody, J. E.	70	Richardson, J. P.	13
Moomaw, L.	20	Ririe, D.	47
Moore, A. W.	20	Roberts, E.	26
Moore, W. R.	59	Roberts, J. E.	23
Morrow, J.	56	Robertson, L. S.	32
Mortensen, J. E.	11	Robinson, A. R.	62
Mortland, M. M.	1	Robinson, T. W.	54
Murphy, H. J.	69	Robinson, W. O.	34
Myers, W. M.	16, 18	Rogers, A.	33
		Rohwer, C.	44, 62
Neal, O. R.	36	Roller, E. M.	12
Nelson, M. W.	26	Ross, P. E.	38
Nesius, E. J.	59	Rothgeb, R. C.	13
Newman, A. S.	2	Roundy, R. A.	57
Newton, H. P.	43	Rowe, P. B.	49
Nicholson, H. H.	32	Ruhlogg, M.	34
Noll, J. J.	41	Rummell, R. S.	57
Norris, M. J.	70	Russell, G. C.	51
Nygard, I. J.	65	Russell, M. B.	67
		Ryerson, G. E.	18
O'Neal, A. M.	6		
Osborn, B.	61	Salter, R. M.	22, 40, 44, 45
Osterli, V. P.	17	Sampson, A. W.	10
Overson, M. M.	51	Samuels, G.	67
Overstreet, R.	34	Sartz, R. S.	39
		Sauer, E. L.	21, 27, 52, 64
Packer, P. E.	13	Saunderson, M. H.	40
Page, J. B.	21	Savage, D. A.	24, 49
Pair, C.	44	Scarsbrook, C. E.	66
Patel, D. K.	4	Schaller, F. W.	45
Parker, D. I.	58	Schleusener, P. E.	44
Parker, E. R.	10	Schmehl, W. R.	47
Parker, F. W.	31	Schwarze, H. E.	64
Parker, K. W.	57	Scott, W. A.	33
Parks, R. Q.	24, 26	Scoville, O. J.	27
Paul, B. H.	22	Searcy, V. S.	57
Pearson, R. W.	21	Shaw, E.	63
Pechanec, J. F.	16	Shaw, W. M.	60
Peech, M.	47, 65	Shearer, M. N.	27
Petersen, J. S.	44	Shearin, A. E.	71
Peterson, A. E.	56	Sheldon, W. H.	50
Pierre, J. J.	35	Sherman, G. D.	2, 8
Plummer, A. P.	15	Siegel, J. J.	69
Potts, R. C.	30	Sieling, D. H.	51
Pratt, P. F.	3, 18	Simkins, C.	60
Prince, F. S.	49	Skibitzke, H. E.	55
		Slater, C. S.	21, 41
Rajagopalan, K. S.	63	Smith, D. D.	46
Ramig, R. E.	51	Smith, D. H.	68
Rankin, W. H.	16	Smith, E. L.	29
Rea, H. E.	14, 23, 30	Smith, H. M.	27
Read, R. A.	35	Smith, H. P.	30
Ree, W. O.	21, 25	Smith, J. C.	15
Reed, I. F.	51	Smith, J. L.	60
Reeve, R. C.	7	Smith, P. F.	63
Reid, E. H.	20, 57	Smith, R. M.	62
Reitz, H. J.	9	Smith, T. B.	54
Renner, F. G.	16	Southworth, W. L.	55
Reuther, W.	63	Sowden, F. J.	58

	<u>Page</u>
Specht, A. W.	63
Sperry, O. E.	56
Stabler, S. P.	13
Stall, J. B.	41, 52, 64
Stallings, J. H.	7, 17, 24, 61
Stanford, G.	9, 12
Stanley, E. B.	29
Staple, W. J.	43
Stark, E.	50
Staten, G.	25
Stephens, J. C.	25
Stevenson, F. J.	6
Stewart, E. H.	52
Stewart, G.	19, 57
Stewart, I.	40
Stobbe, P. C.	7
Stockwell, H. J.	32
Stoddart, L. A.	9, 19, 29, 33, 57
Stokes, C. M.	51
Storie, R. E.	68
Strohm, J.	41
Sturgis, M. B.	66
Sund, J. M.	33
Swanson, C. L. W.	31, 61, 71
Swarner, L.	29
Swindle, L. D.	13
Tanner, C. B.	4
Taylor, A. B.	64
Taylor, S. W.	9, 21, 63
Temple, L. G.	29
Templin, E. H.	33
Terman, G. L.	69
Terrault, P. A.	50
Thomas, J. F.	51
Thomas, J. R.	2
Thomas, R. P.	47
Thompson, M. J.	38
Thompson, W. N.	61
Throckmorton, R. I.	32
Tompkins, G. P.	14
Toth, S. J.	43, 47
Trew, E. M.	14, 19
Truog, E.	4, 56
Tucker, E. A.	24
Turk, L. M.	69
Turner, G. T.	40
Turner, S. F.	55
Tyson, J.	60
Upchurch, R. P.	37
van Bavel, C. H. M.	43, 48, 67
Van Doren, C. A.	5
Varner, J. E.	6
Vavra, J. P.	66
Vengris, J.	18
Verma, A. B. S.	19
Volk, G. W.	47
Voelker, S. W.	21
Wadleigh, C. H.	34
Wahlenberg, W. G.	11
Waksman, S. A.	28

	<u>Page</u>
Walker, P.	42
Walker, R. L.	2
Waltner, A. W.	48
Wander, I. W.	9
Wasser, C. H.	20
Watson, J. R.	56
Weaver, H. A.	2, 37
Weihing, R. M.	23
Weir, W. W.	11
Wennblonn, R. D.	42
Wentworth, C. K.	33
Werner, P. W.	48
Whiteside, E. P.	66
Whitfield, C. J.	14
Whitman, W. C.	20
Whitney, R. S.	65
Whitt, D. M.	46
Wieslander, A. E.	68
Wilcox, L. V.	13
Willard, C. J.	52
Williams, B. H.	65
Williams, R. M.	51
Willis, J. E.	21
Wilm, H. G.	26, 52
Wilson, F. G.	17
Winterberg, S. H.	60
Wolfolk, E. J.	57
Wolters, F. A.	23
Wood, I. D.	35
Wood, V. A.	35
Woodruff, C. M.	16
Woodruff, N. P.	3
Work, R. A.	26, 27
Wrigley, R. L.	19, 57
York, E. T.	40
Young, H. C.	34
Young, V. A.	11, 56
Zehner, C. E.	33
Zingg, A. W.	2, 3
Zwerman, P. J.	35

